RADIOGRAPHS
OF THE BONES AND JOINTS

RADIOGRAPH OF A TWIN (STILL-BORN), WEIGHT 6 LB.

(By the kindness of Drs. Orford and Mitchell.)

A DESCRIPTIVE ATLAS

OF

RADIOGRAPHS

OF THE BONES AND JOINTS:

FOR STUDENTS AND PRACTITIONERS.

BY

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NEW YORK: WILLIAM WOOD AND COMPANY

MDCCCCXXIV

THIS BOOK IS
RESPECTFULLY DEDICATED
TO
WALTER THOMPSON, Esq., F.R.C.S.,
IN
RECOGNITION OF THE KINDNESS
HE HAS ALWAYS SHOWN ME

INTRODUCTION

THE object of this Atlas is to provide students and practitioners with a handy book of reference for the interpretation of the radiographs which are becoming increasingly more useful for accurate diagnosis.

The somewhat unsatisfactory way in which X-ray prints are made use of in text-books, and in the compiling of clinical records, led me to evolve the Silhouette Radiograph,* which at once combines the properties of a radiograph with those of a silhouette. The ordinary radiographic print is a shadow photograph of bone; the silhouette makes plain also the contour of the limb or other soft parts visible in the negative. If the outline of the parts be scratched on the negative before printing, in the manner to be shown, the pictures will have an added value to the practitioner, to whom the negatives cannot be sent for fear of breakage in transit. From the pictorial point of view the addition of the black background enhances the bony definition, and gives the print a more complete appearance. Moreover, a clean-cut silhouette often shows more than a photograph, so that the latter can often be dispensed with. In short, the addition of the silhouette imparts a much needed reality to the radiograph, without interfering with the best possible bony definition.

The first part of the Atlas contains plates of the normal bones and epiphyses, and these are arranged on the left side of the volume; the pathological conditions, on the other hand, appear on the right-hand pages, so that they can the more readily be compared. (The corresponding numbers are indicated.) I have noted great variability in the times of appearance of the centres of ossification, and of the union of epiphyses. Instead, therefore, of giving the usual times quoted in the text-books, I have prepared a series of radiographs showing the appearances at different ages.

The majority of the plates have been taken from those made in routine examination, only a few having been made expressly for the Atlas. Radiographs have been selected on many occasions because of personal knowledge of the case or because good notes were available, in preference to others about which nothing was known. A perfect series is not aimed at so much as one which will aid in diagnosis.

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* "X-ray Prints: A Suggestion", *Brit. Jour. Surg.*, 1923, Jan. "The Silhouette Radiograph", Demonstration at Brit. Med. Assoc. Annual Meeting, 1923, *Brit. Med. Jour.*, 1923, Oct. 13. "The Silhouette Radiograph", *Lancet*, 1923, Oct. 6.

It is a pleasure to acknowledge my indebtedness to the Honorary Staff of the General Infirmary at Leeds for permission to use many of their cases, and to many friends for much valuable help, especially Drs. H. M. Holt, T. Jago, and J. A. Young; also to Dr. Wharlow for the use of several plates. Dr. Scargill and his assistants in the radiological department have given me every opportunity to carry out the details of my work, and most valuable help in the preparation of the radiographs. Dr. Rowden has permitted me to use many of his beautiful plates, and his interest in my efforts has been very stimulating. To all of these I tender my grateful thanks.

My warmest thanks are due to my sister for her constant help, and to my wife for her loyal co-operation during the last three years, without which nothing might have been accomplished.

Lastly, I desire to express my appreciation of the courtesy of Messrs. John Wright & Sons Ltd., and of the pains which they have taken in the preparation of the illustrations.

A. P. BERTWISTLE.

General Infirmary, Leeds,
March, 1924.

LIST OF RADIOGRAPHS

Frontispiece.—Radiograph of normal new-born infant.

Part I.—The Process.

Part II.—Normal Bones and Epiphyses.

Part III.—Fractures.

Part IV.—DISEASES OF BONES.

Part V.—Injuries and Diseases of Joints.

Part VI.—Miscellaneous.

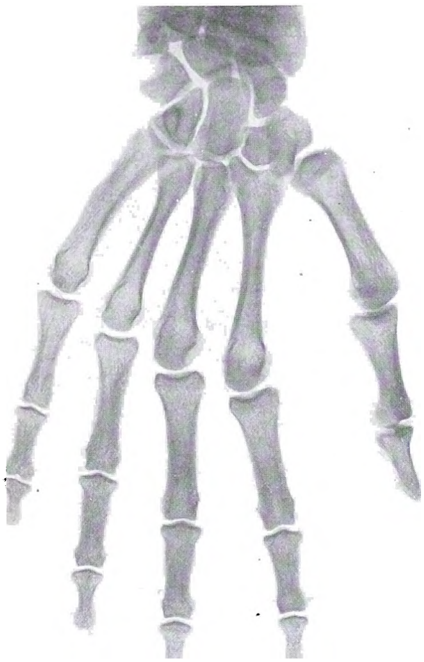
PART I.

THE PROCESS

THE PROCESS

The method of preparing the silhouette radiograph is extremely simple. The negative is held up to the light, or, better, placed in an illuminator, and the fleshy contour, which is always apparent on the negative, is carefully scratched with a mounted needle. The print now made reveals the outline of the part as a black line. The background is then filled in with Indian ink, completing the silhouette radiograph. In the case of films, both sides of the negative require to be scratched, and often reflected light is necessary, as it may be, on rare occasions, with plates.

The process is necessitated by the inability of printing paper, especially bromide—which is the one almost universally used—to indicate a structure whose density is so slight as is that of the skin without giving an exposure so long that the bony definition is sacrificed.



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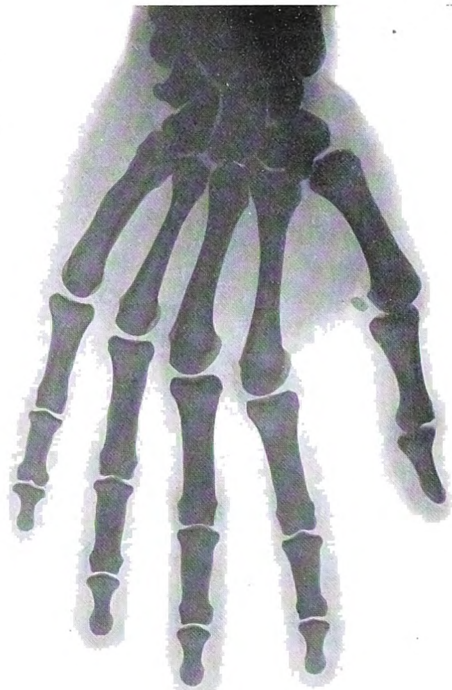

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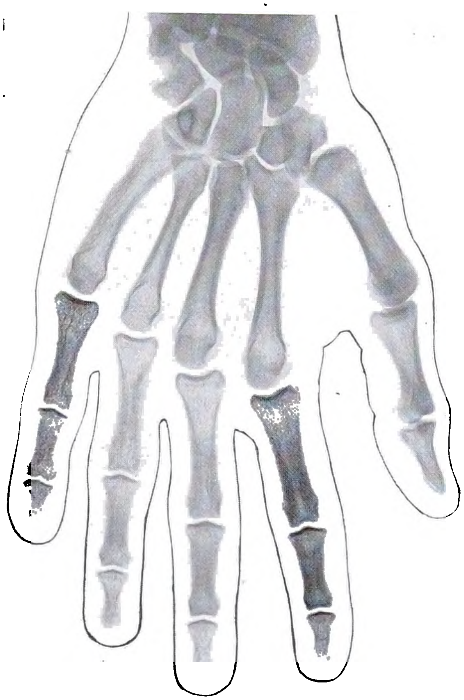

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THE PROCESS, continued.

Fig. 1.—Hand : Ordinary Radiograph.

Note the complete absence of the skin outline in spite of the non-bulky nature of the part, which usually permits of showing soft tissues.

Fig. 2.—Hand : Over-exposed Radiograph showing Skin Outline.

Observe that this has been accomplished at the expense of the bony definition. Even here it would be difficult to diagnose a condition merely on the surface contour.

Fig. 3.—Hand : Silhouette Radiograph, 1st Stage.

The outline on the negative has been scratched with a needle and a print taken.

Fig. 4.—Hand : Silhouette Radiograph, Final Stage.

The silhouette has been completed by filling in the background with Indian ink. Notice the ease with which (*a*) a dislocated thumb (*see Fig.* 229), (*b*) a dislocated phalanx (*see Fig.* 228), (*c*) a periosteal whitlow (*see Fig.* 156), (*d*) phalangeal osteomyelitis (*see Fig.* 157), (*e*) rheumatoid arthritis (*see Fig.* 268), or (*f*) tumour (*see Fig.* 207) could be almost diagnosed by the inspection of the skin alone.

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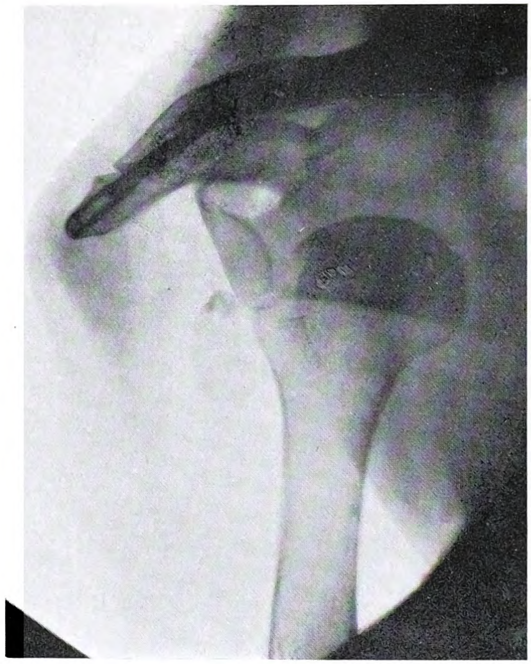

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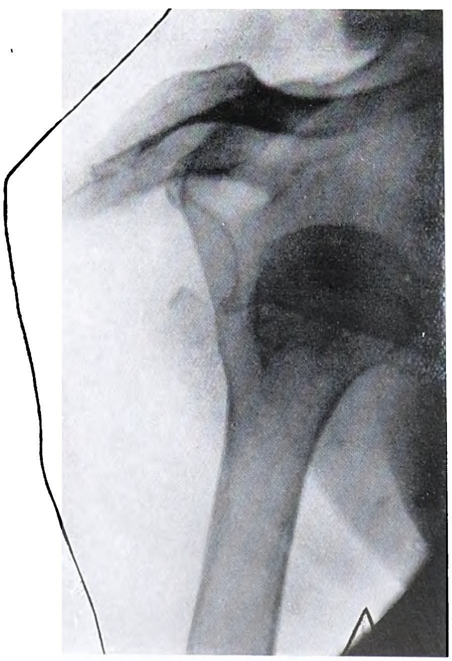

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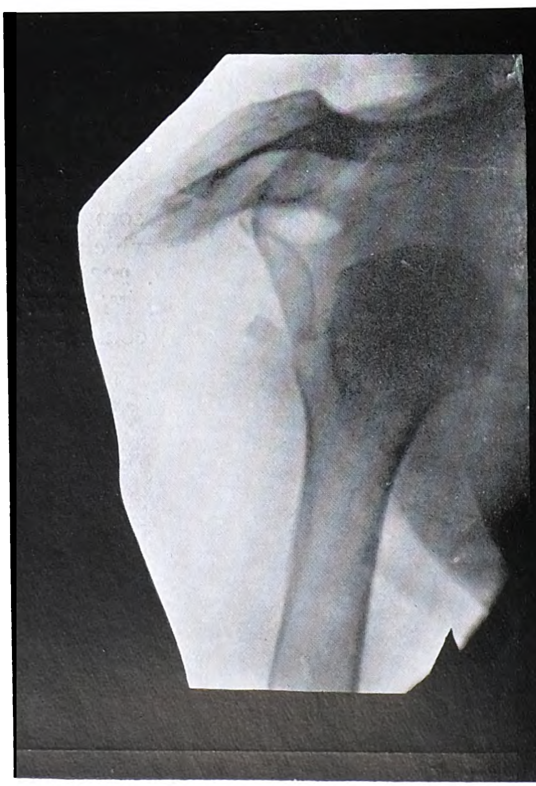

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THE PROCESS, continued.

Fig. 5.—Dislocated Shoulder: Ordinary Radiograph.

Fig. 6.—Dislocated Shoulder: Over-exposed Radiograph showing Skin Outline.

The skin is only visible in the neck. The print was taken from a film, and it is often difficult to see the flesh on films except by reflected light.

Fig. 7.—Dislocated Shoulder: Silhouette Radiograph, 1st Stage.

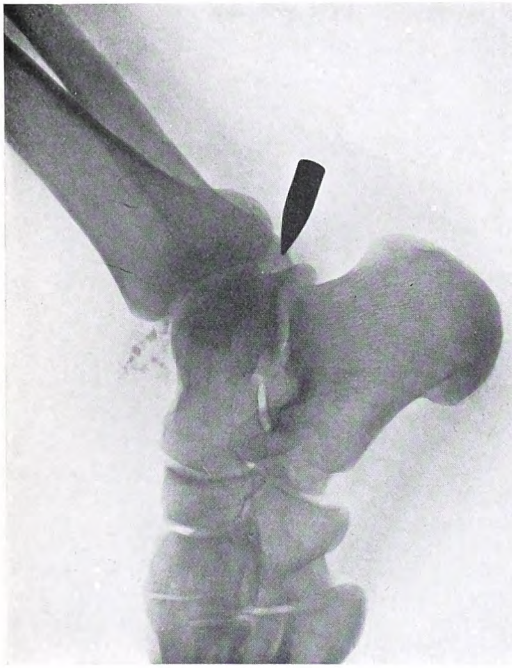
Both sides of the film have been scratched.

Fig. 8.—Dislocated Shoulder: Silhouette Radiograph, Final Stage. (*See Fig.* 16.)

Note the more finished appearance. Two classical signs are manifest: (1) Hamilton's ruler test: i.e., a ruler placed on the tip of the acromion and external condyle will leave a gap between it and the arm. (2) Calloway's test: there is increased axillary girth.

This dislocation occurred in a woman of 72. Reduction was attempted under gas, but was unsuccessful owing to the loose fragment of the great tuberosity, so the patient was admitted. When next examined the arm had assumed the 'subluxatio erecta' position. Reduction was then easily accomplished.

[*Mr. Collinson.*]



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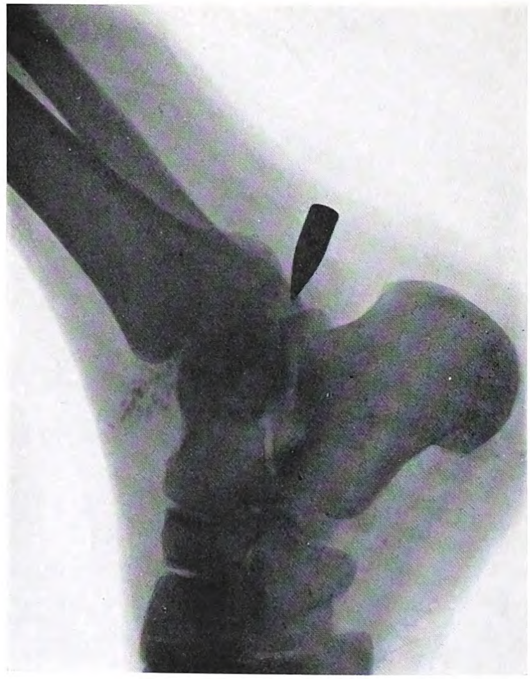

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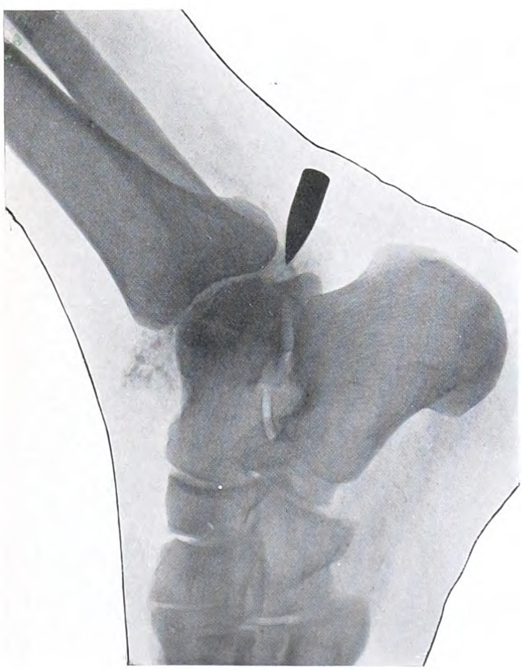

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THE PROCESS, continued.

Fig. 9.—Bullet in Ankle: Ordinary Radiograph.

Note the absence of fleshy contour.

Fig. 10.—Bullet in Ankle: Over-exposed Radiograph showing Skin.

Note the over-exposure of the bones.

Fig. 11.—Bullet in Ankle: Silhouette Radiograph, 1st Stage.

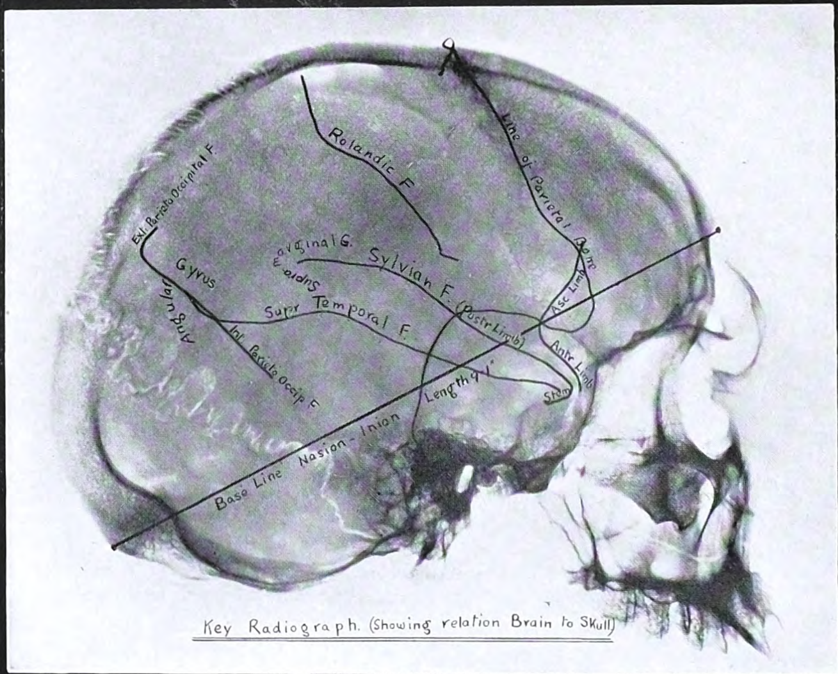
The contour on the negative has been scratched.

Fig. 12.—Bullet in Ankle: Silhouette Radiograph, Final Stage.

Note the position of the bullet in relation to the skin, and the irregularity of the skin over the bullet. The scattered particles in front of the joint probably indicate the place of entry of the missile, which has therefore been rotated through 180°.

PART II.

NORMAL BONES AND EPIPHYSES



Key Radiograph. (Showing relation Brain to Skull)

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14

NORMAL BONES AND EPIPHYSES

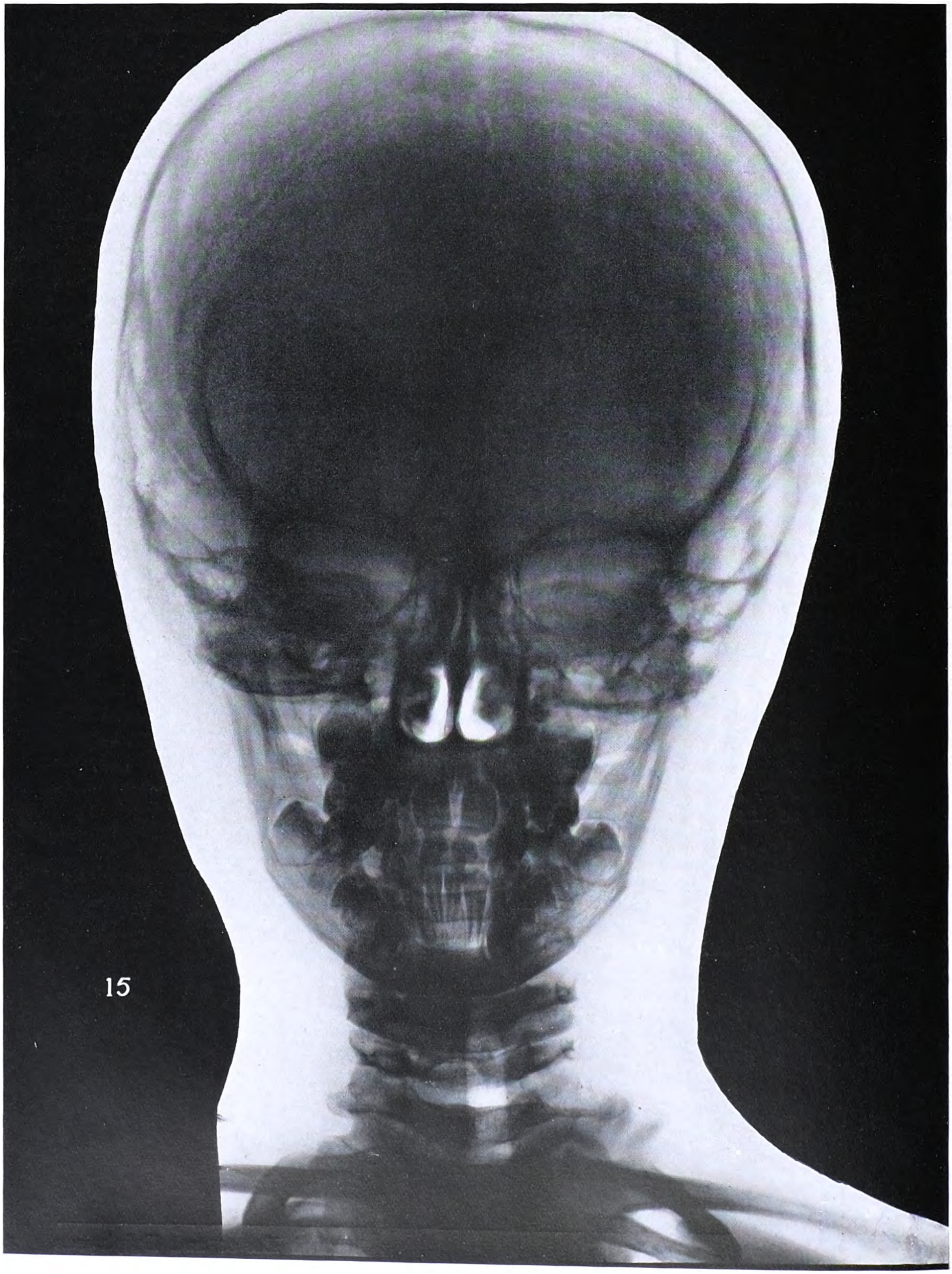
Fig. 13.—Skull: Key Radiograph. (*See Fig.* 58.)

This shows the relation of convolutions of the brain to the skull as a whole, and to the parietal bone.

Radiological Localization.—To locate the site of the injury, the following method was devised. The half of a sagittally divided skull with a corresponding half of a brain were taken. Between the more important gyri were implanted pieces of copper wire moulded according to the shape of the sulci. The boundaries of the parietal bone—where not obvious—were marked by glueing on to its margin a thin copper wire. The brain was placed in the skull and radiographed lying on its mesial surface, so that the picture is a true lateral one. It will be noticed that horizontal sulci lie nearer the vertex than are shown in text-books. The vertical ones show an apparent decrease in length which can only be accounted for by the convexity of the brain. This key radiograph is useful in reading radiographs of skulls, as one cannot compare the latter with the normal craniocerebral topographies of manuals; these depict the skull at different angles for the purpose of showing the vertex. A base line is drawn from nasion to inion on both skiagrams, and by means of lengths along this line and perpendicular to it, localization is possible, as is shown in *Fig.* 58, no matter what the size of the skull. (*Brit. Jour. Surg.*, 1923, July.)

Fig. 14.—Skull: Normal.

Male, age 26. Lateral view.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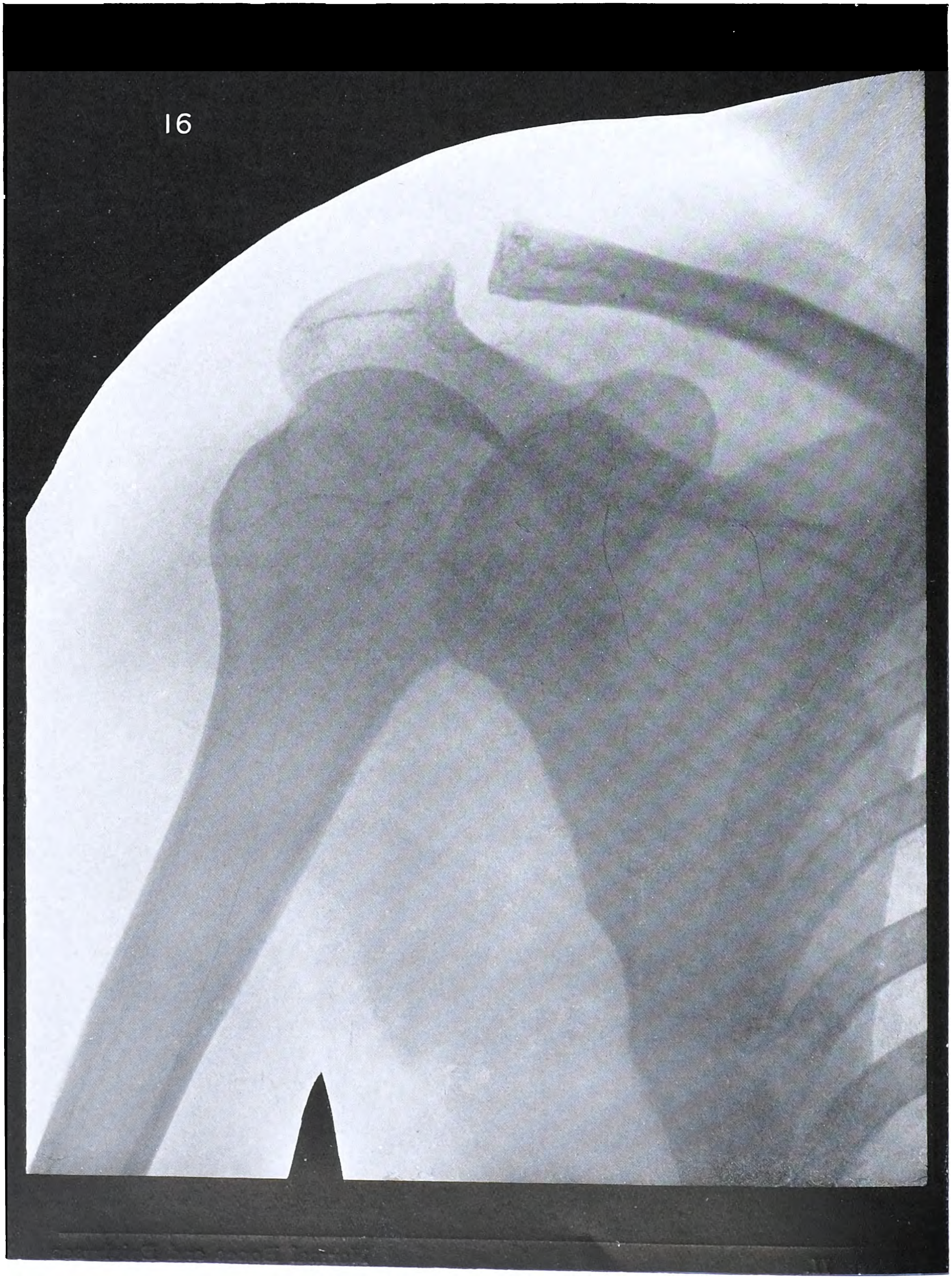
NORMAL BONES AND EPIPHYSES, continued.

Fig. 15.—SKULL : NORMAL.

Antero-posterior view.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NORMAL BONES AND EPIPHYSES, continued.

Fig. 16.—SHOULDER: NORMAL.

Age 45.

17

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NORMAL BONES AND EPIPHYSES, continued.

Fig. 17.—Elbow : Normal.

Age 27. Antero-posterior view.

Fig. 18.—Elbow : Normal.

Age 21. Lateral view.

Fig. 19.—Wrist : Normal.

Age 24. Lateral view.
[*Lancet*, 1923, Oct. 6.]

Fig. 20.—Wrist : Normal.

Antero-posterior view.

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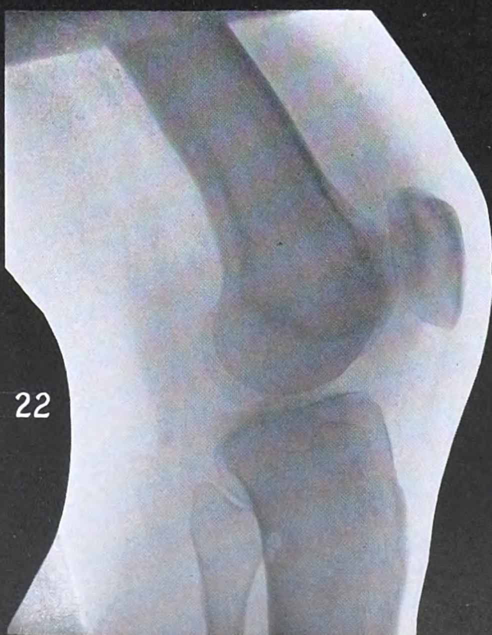

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NORMAL BONES AND EPIPHYSES, continued.

Fig. 21.—Hip: Normal.

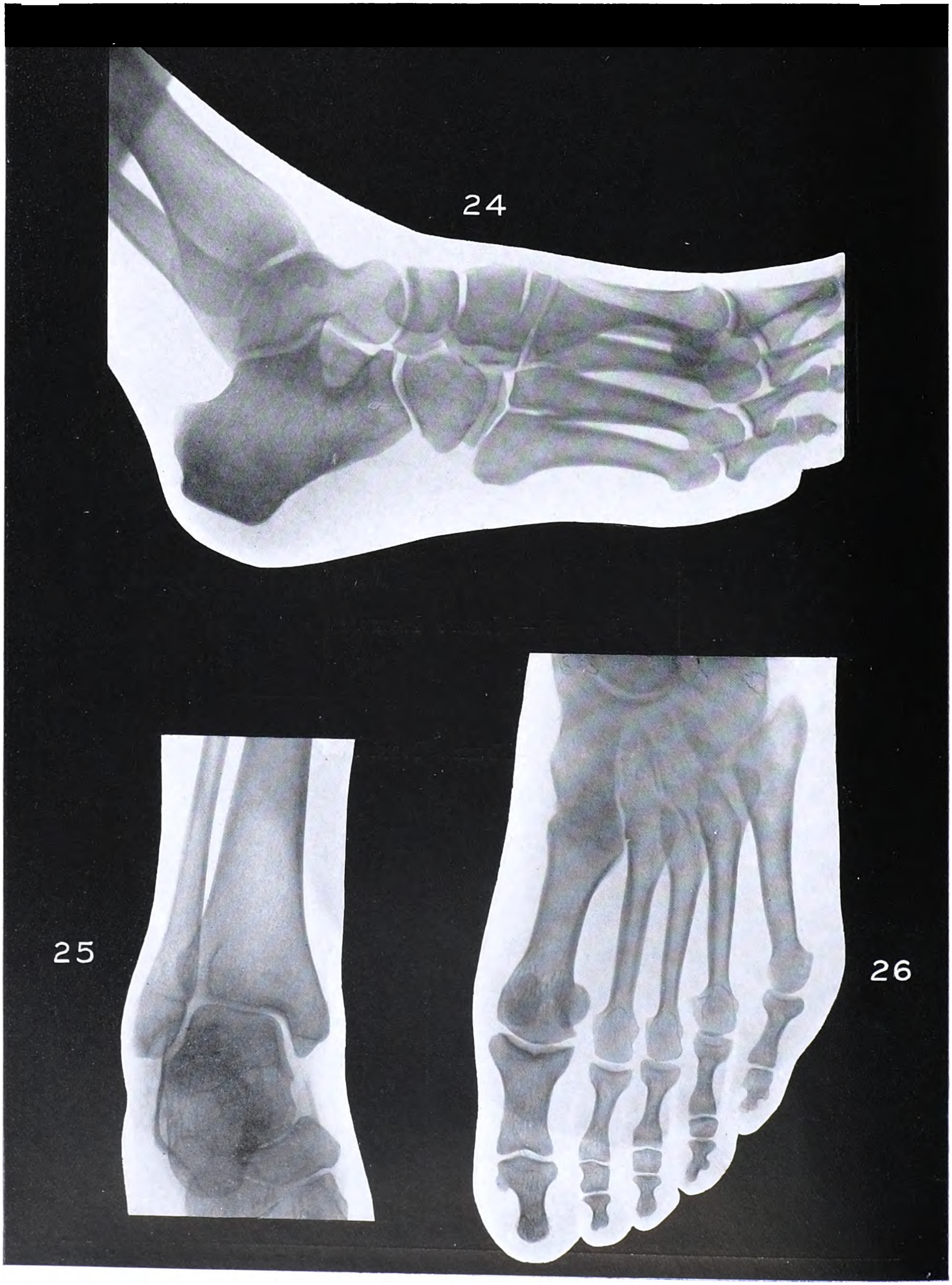
Age 48.

Fig. 22.—Knee: Normal.

Female, age 33. Lateral view.

Fig. 23.—Knee: Normal.

Antero-posterior view.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NORMAL BONES AND EPIPHYSES, continued.

Fig. 24.—Ankle: Normal.

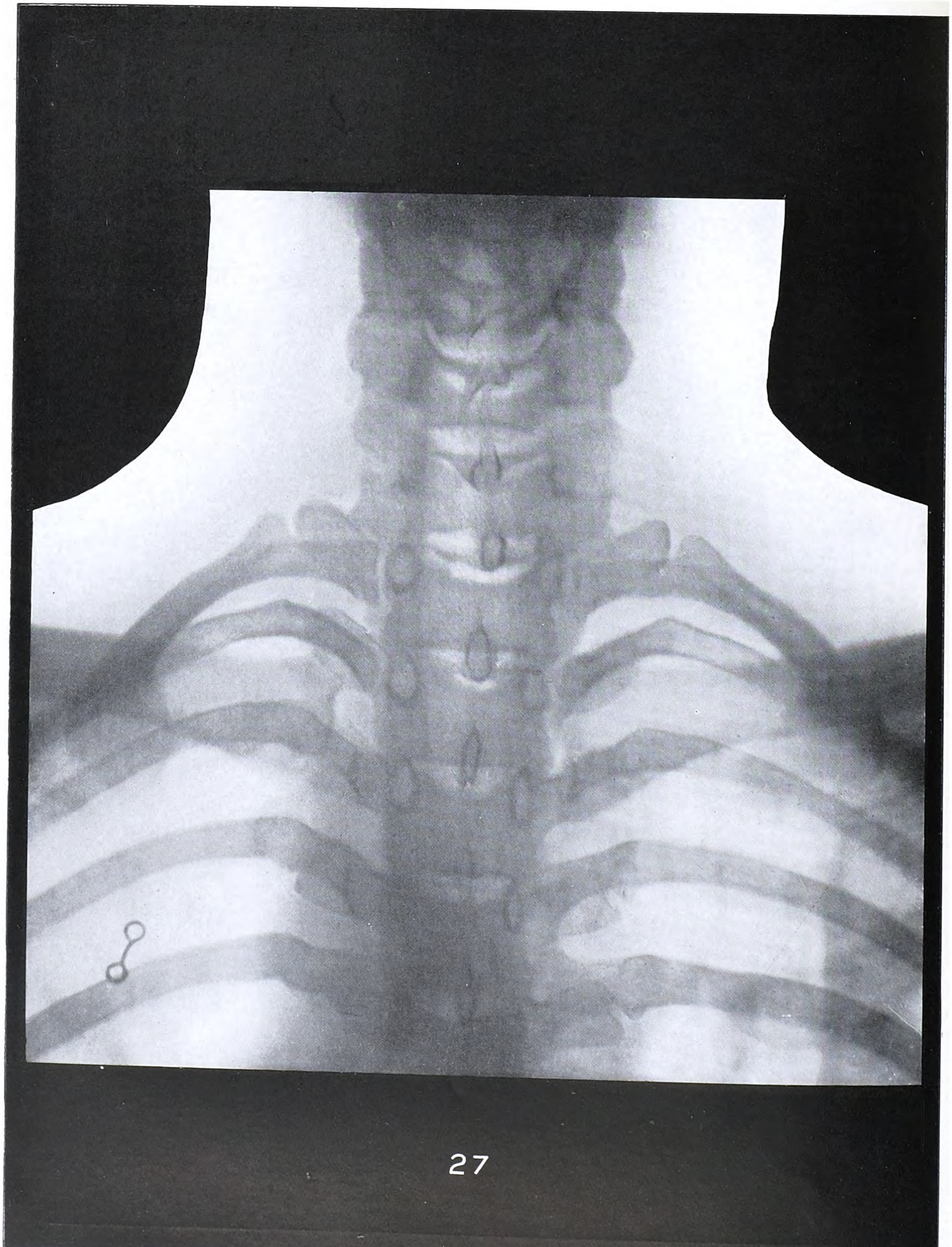
Lateral view.

Fig. 25.—Ankle: Normal.

Female, age 25. Antero-posterior view.

Fig. 26.—Foot: Normal.

Female, age 23. Antero-posterior view.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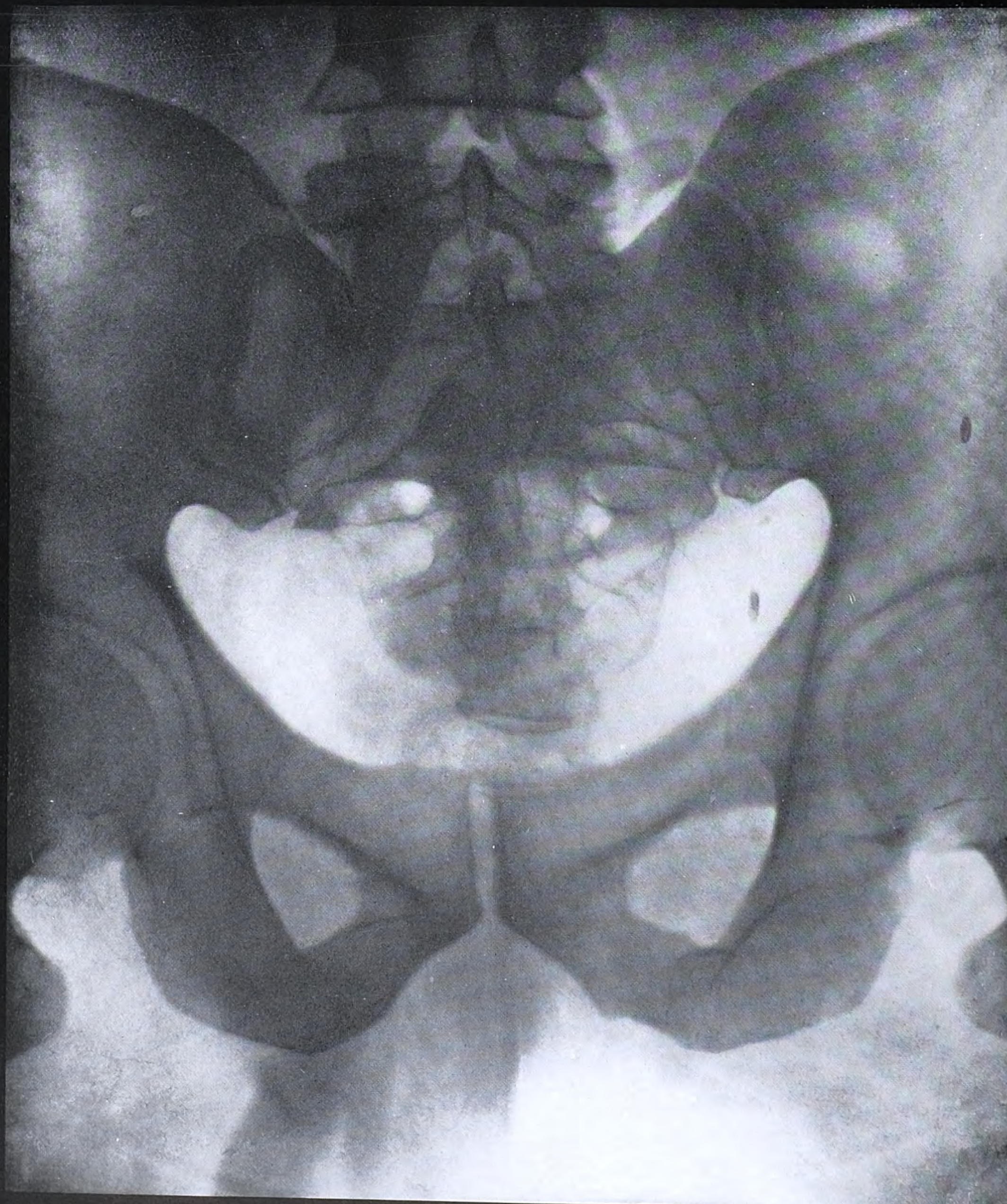
NORMAL BONES AND EPIPHYSES, continued.

Fig. 27.—Neck: Normal.

Antero-posterior view.



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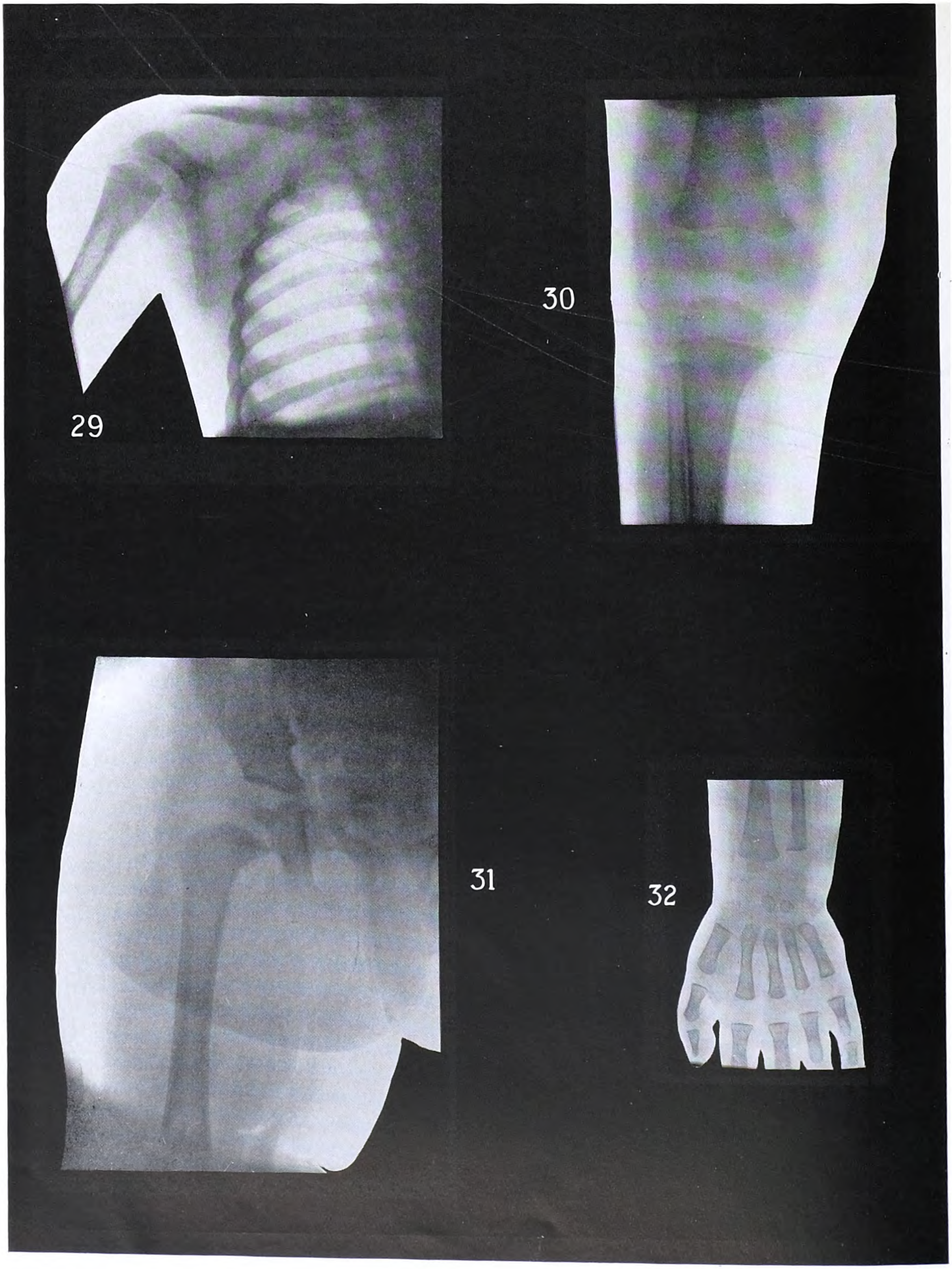
NORMAL BONES AND EPIPHYSES, continued.

Fig. 28.—PELVIS: NORMAL.

Male, age 57.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NORMAL BONES AND EPIPHYSES, continued.

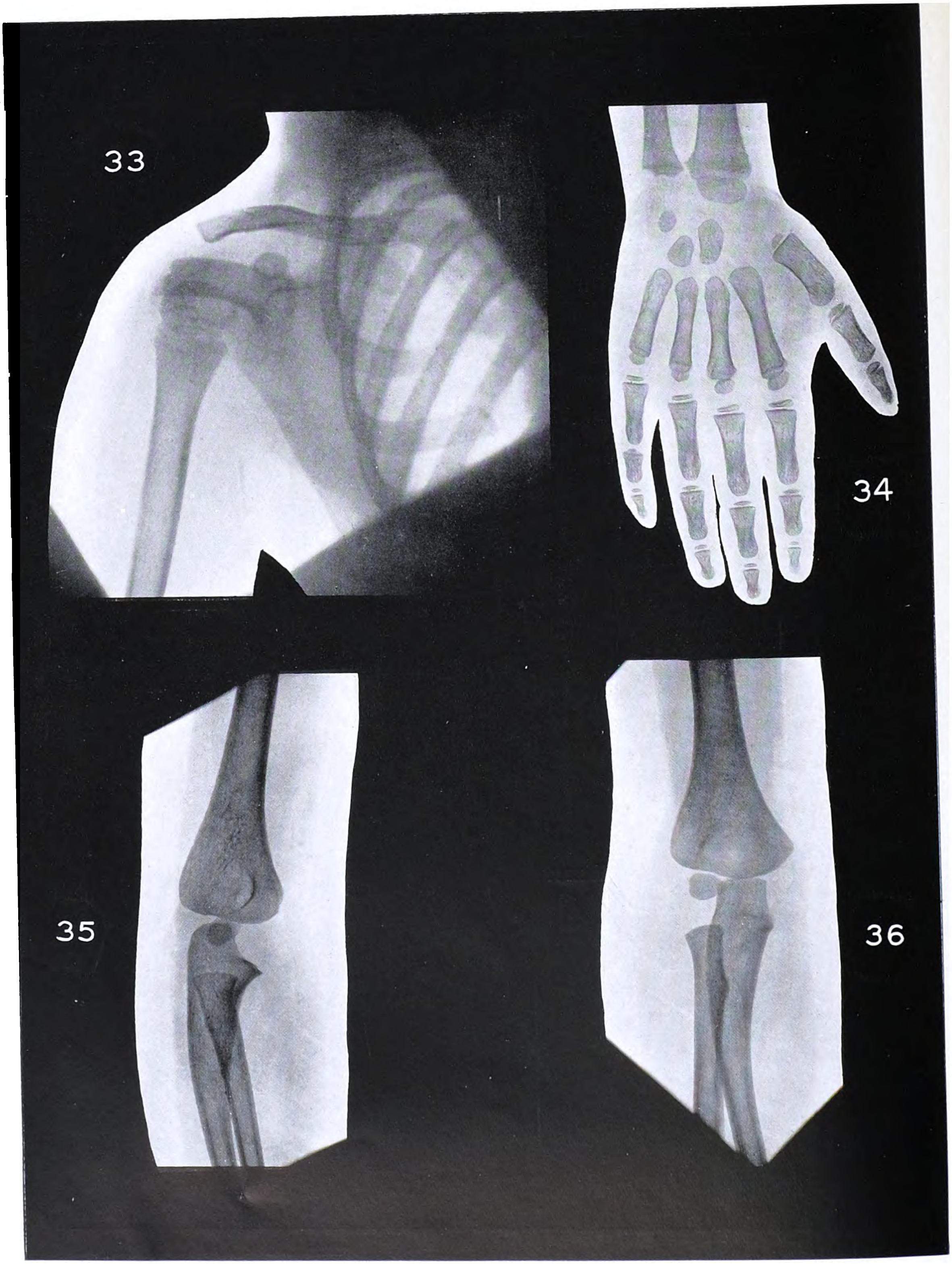
Figs. 29–32.—NORMAL BABIES.

Fig. 29.—SHOULDER.
Age 12 months.

Fig. 30.—KNEE.
Age 15 months.

Fig. 31.—HIP.
Age 15 months.

Fig. 32.—HAND AND WRIST.
Age 18 months.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NORMAL BONES AND EPIPHYSES, continued.

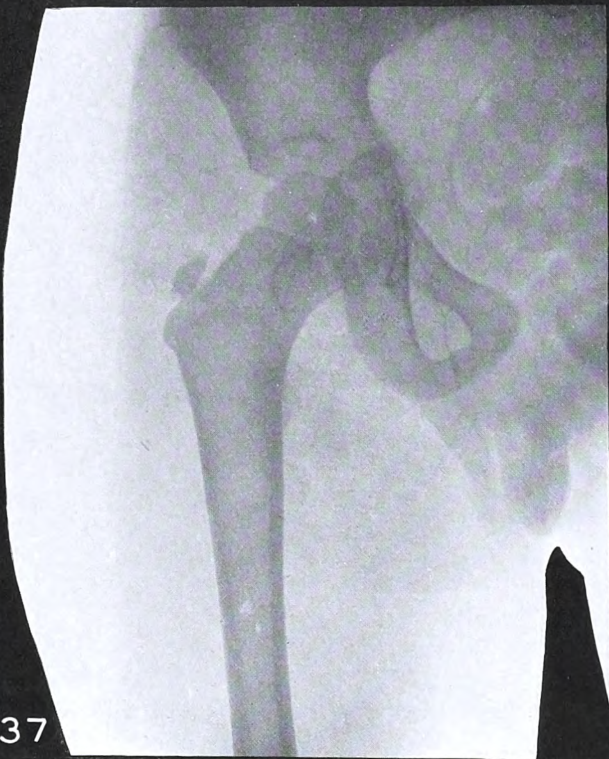
Figs. 33–36.—Normal Girl, age 5.

Fig. 33.—Shoulder.

Fig. 34.—Hand.

Fig. 35.—Elbow.
Lateral view.

Fig. 36.—Elbow.
Antero-posterior view.



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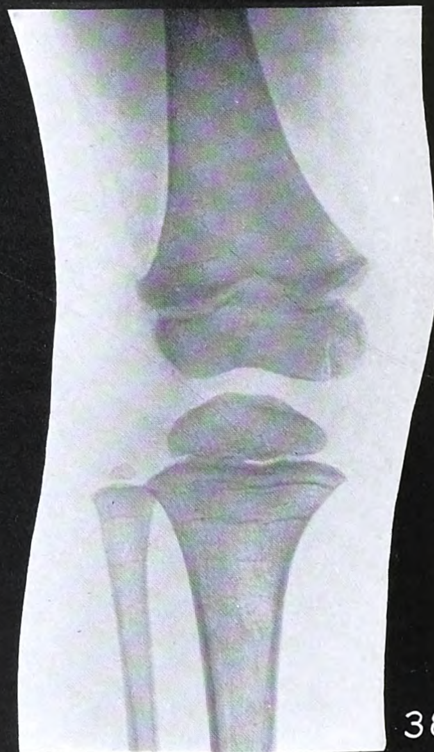

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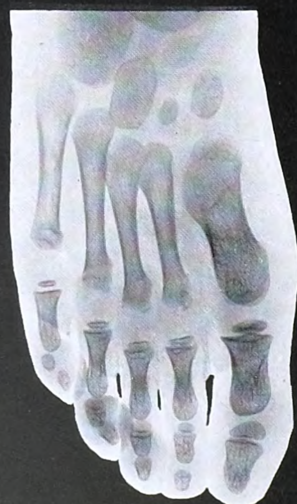

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NORMAL BONES AND EPIPHYSES, continued.

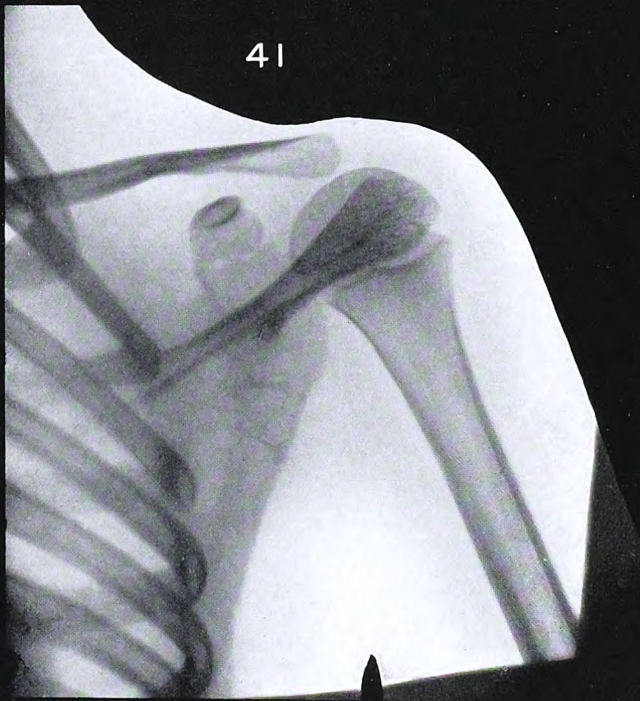
Figs. 37–40.—NORMAL GIRL, AGE 5 (*continued*).

Fig. 37.—HIP.

Fig. 38.—KNEE.
Antero-posterior view.

Fig. 39.—ANKLE.
Lateral view.

Fig. 40.—FOOT.
Antero-posterior view.



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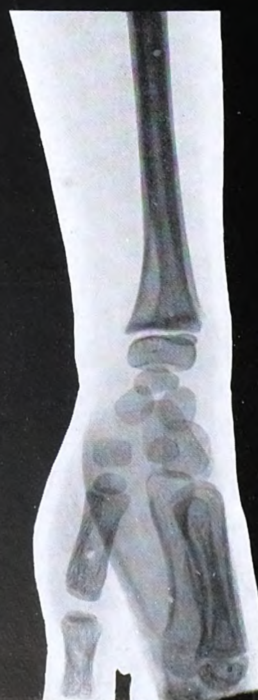

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NORMAL BONES AND EPIPHYSES, continued.

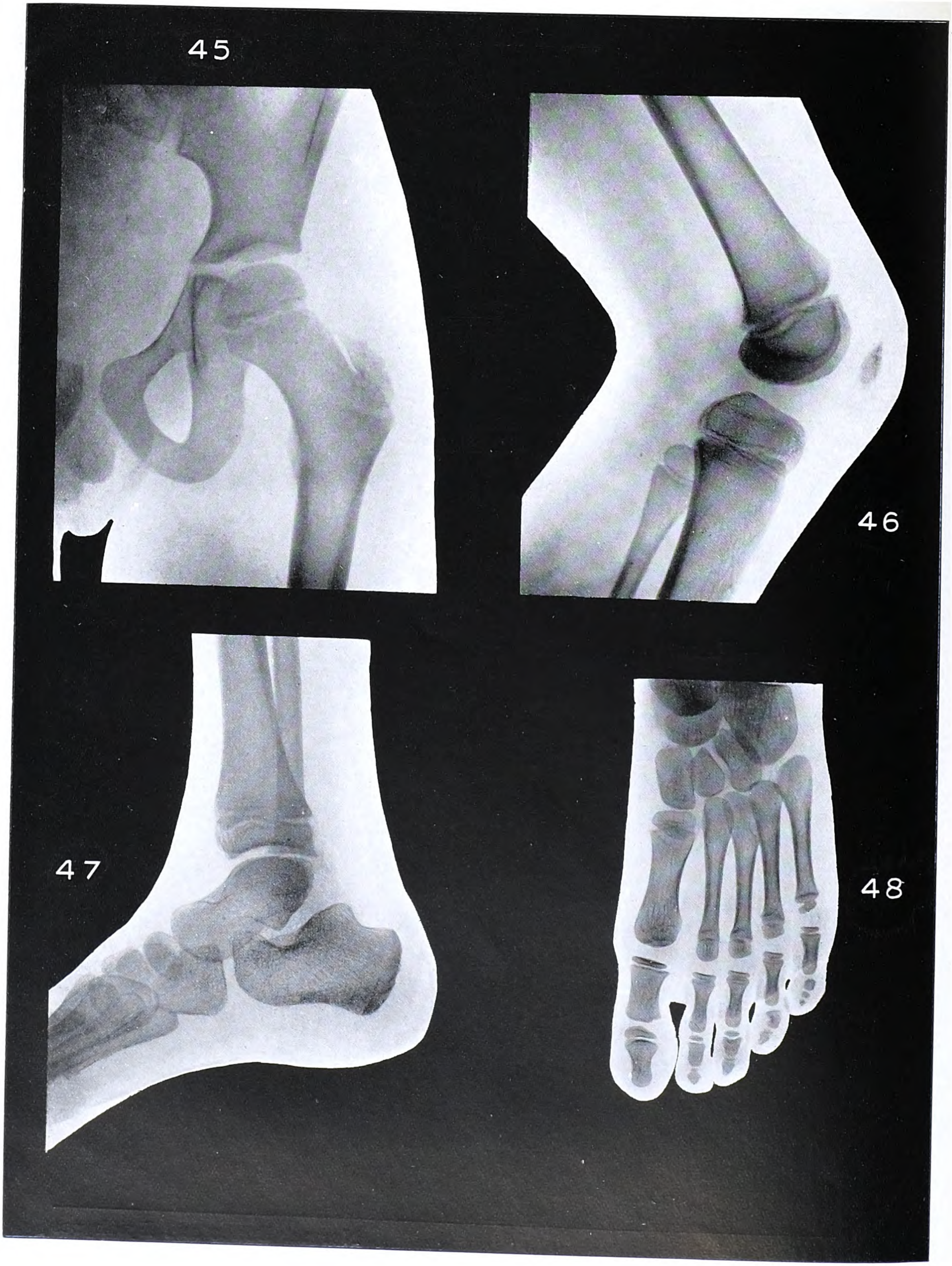
Figs. 41–44.—Normal Boy, age 9.

Fig. 41.—Shoulder.

Fig. 42.—Hand.

Fig. 43.—Elbow.
Lateral view.

Fig. 44.—Wrist.
Lateral view.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NORMAL BONES AND EPIPHYSES, continued.

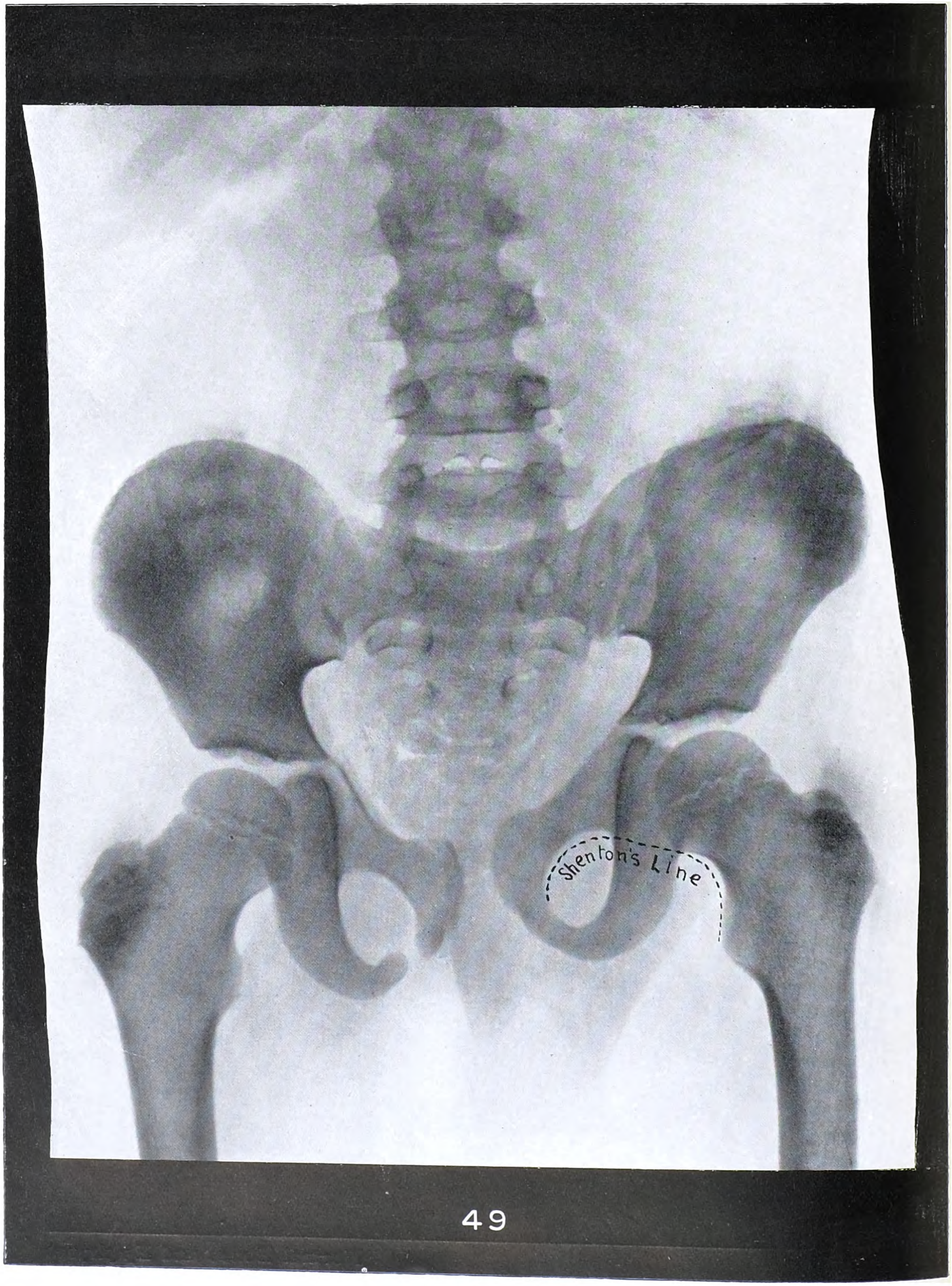
Figs. 45–48.—Normal Boy, age 9 (*continued*).

Fig. 45.—Hip.

Fig. 46.—Knee.
Lateral view.

Fig. 47.—Ankle.
Lateral view.

Fig. 48.—Foot.
Antero-posterior view.


Shenton's Line
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NORMAL BONES AND EPIPHYSES, continued.

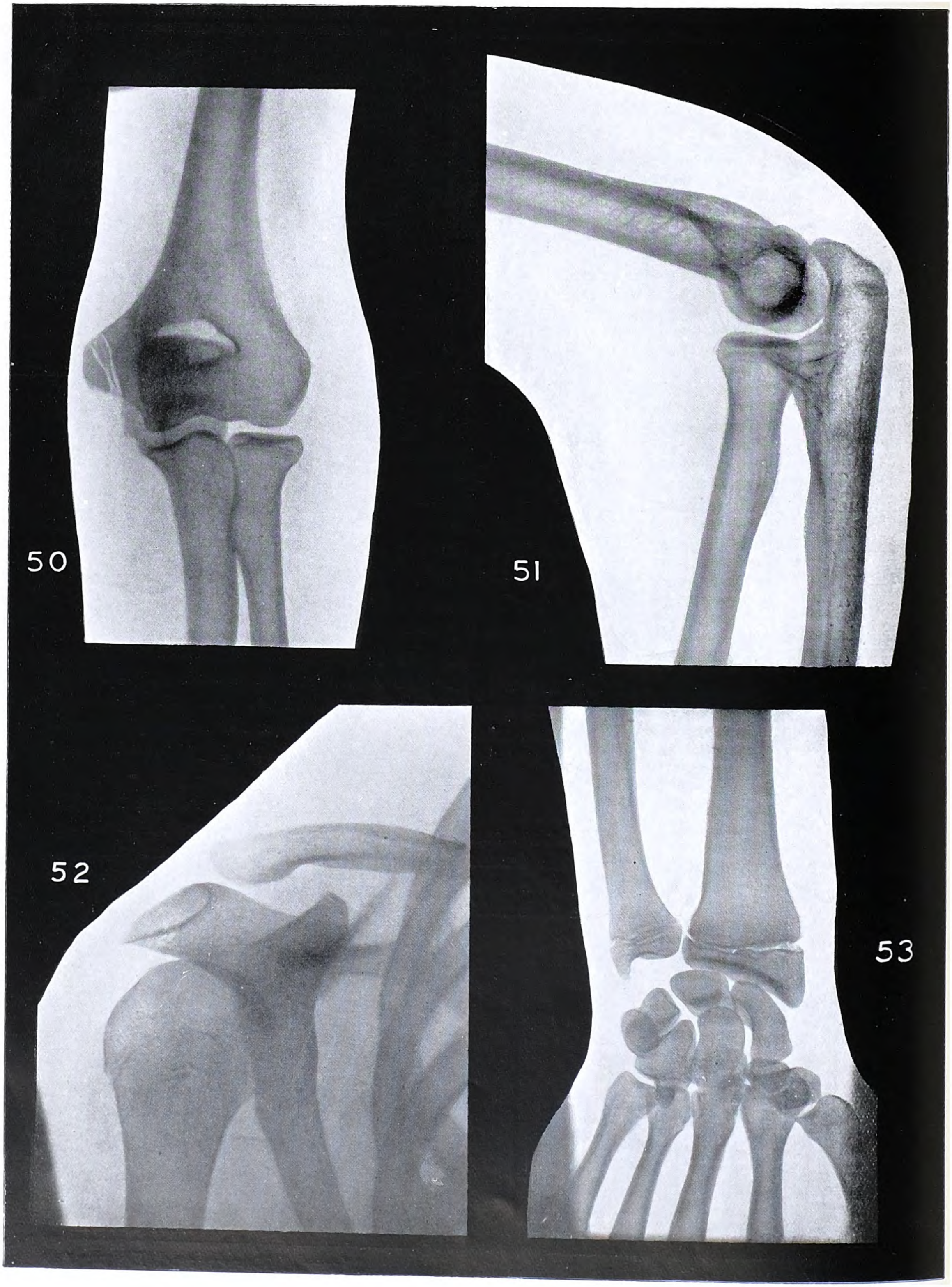
Fig. 49.—Normal Pelvis of Boy, age 12.

Shenton's Line.—" This line, in all positions of the joint—i.e., abduction, adduction, etc., of the femur—is the same, an unbroken arch formed by the top of the obturator foramen and the inner side of the femoral neck. Imagination must connect these two lines before a perfect arch is formed, but a glance will show that this line is a reality and not solely imaginative.

" There are many lesions of the hip-joint which will disturb this line. Congenital and pathological dislocations are good examples.

" It is often said that distortion of the rays makes appearances which resemble displacements in the hip region. To some people distortion may be deceptive, but no amount of distortion will affect this line. Anyone seeing a skiagram of a hip for the first time and taking into consideration the intactness or otherwise of this line could say with certainty whether displacement was present or not.

" Another point is this, that radiograms of the hip regions are often unsatisfactory on account of the thickness and density of the part. Few radiograms, however bad, will fail to show the femoral neck and obturator foramen. Hence, in this respect, the diagnosis will be as correct with a very poor skiagram as with one in which there is the utmost detail." (*Disease of Bone*, pp. 42 and 43. Ed. W. H. Shenton, 1911.)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NORMAL BONES AND EPIPHYSES, continued.

Figs. 50–53.—Normal Adolescent.

Fig. 50.—Elbow.

Boy, age 15. Lateral view.

Fig. 51.—Elbow.

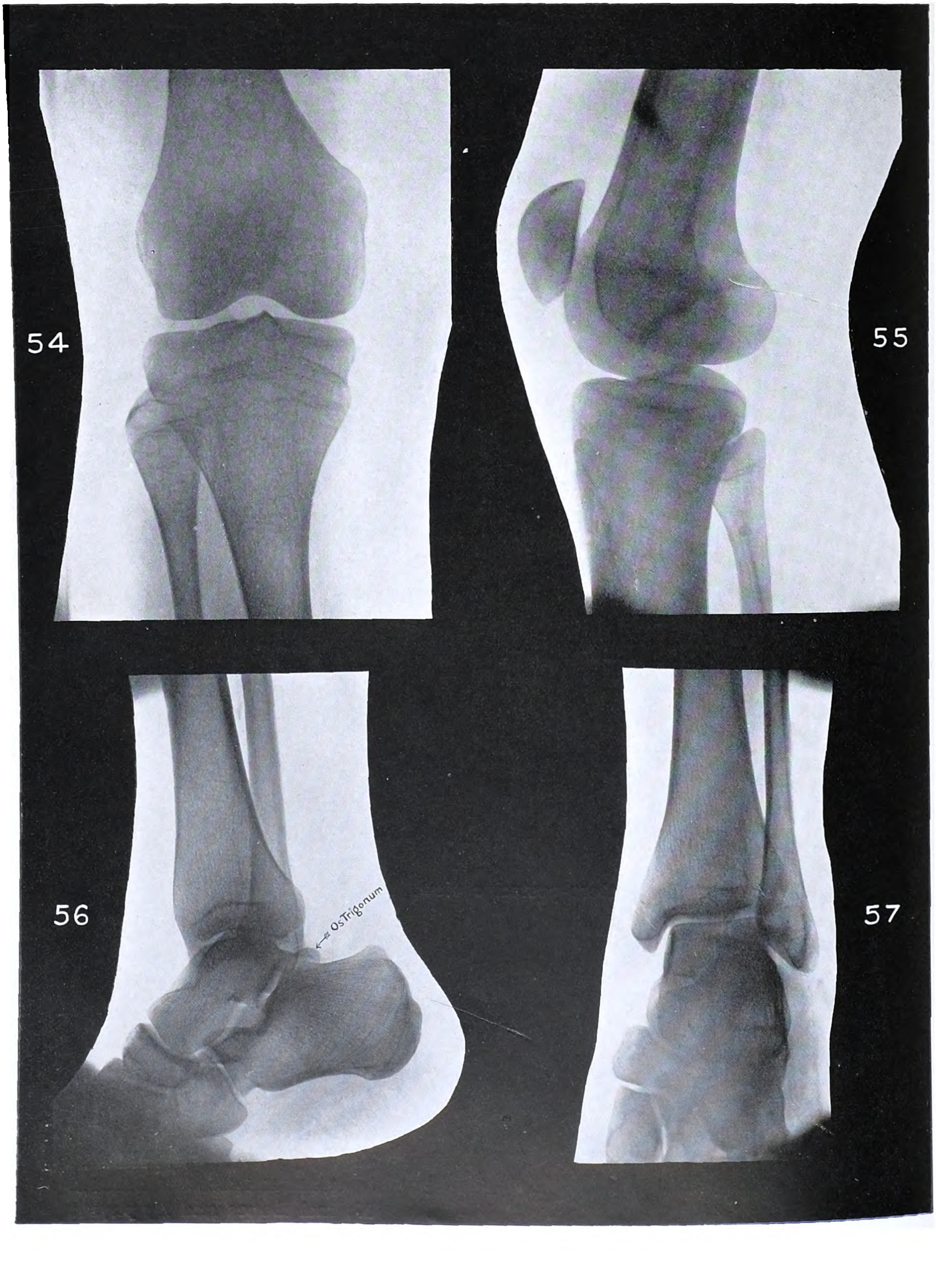
Boy, age 17, Lateral view.

Fig. 52.—Shoulder.

Boy, age 17.

Fig. 53.—Wrist.

Boy, age 15. Antero-posterior view.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Os Trigonum
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NORMAL BONES AND EPIPHYSES, continued.

Figs. 54–57.—Normal Adolescent (*continued*).

Fig. 54.—Knee.

Girl, age 19. Antero-posterior view.

Fig. 55.—Knee.

Boy, age 17. Lateral view.

Fig. 56.—Ankle.

Age 19. Lateral view.

Fig. 57.—Ankle.

Age 19. Antero-posterior view.

PART III.

FRACTURES

FRACTURES.

Fig. 58.—Fractured Skull. (*See Figs.* 13 *and* 14.)

Note that the swelling of the tissues of the scalp is limited to the parietal region; note also the gap in the skull where a depressed portion of bone was removed.

Radiological Localization.—It is necessary that the patient's skull shall be in the same position as the key, i.e., purely lateral. This can be accomplished by placing a small lead bead in each external auditory meatus previous to radiography; the shadows cast by these spheres are then adjusted to lie one over the other. In this case* the expedient was unnecessary in view of the almost complete superimposition of the inferior dental foraminæ. The base lines on skull and key measure 9·1 and 8·6 inches respectively, so that all horizontal distances before translation from skull to key must be multiplied by the constant 9·1/8·6. A perpendicular is now dropped from the middle of the gap in the skull to the base line. It is found to be 1·6 inches from the posterior end, i.e., 1·6 inches $\times$ 9·1/8·6 = 1·7 inches from the inion of the key. The vertical distance between the base line and the vertex, at a point 1·7 inches from the inion, is 4·3 inches on the specimen and 4·5 inches on the key. The actual distance of the middle of the lesion from the base line is 2·7 inches, so that the corresponding point on the key is 2·7 $\times$ 4·5/4·3 = 2·85 inches. From these data it is obvious that the lesion lies over and behind the angular gyrus. It will be seen that the correction for size here is negligible, but in the case of a child it would be all important.

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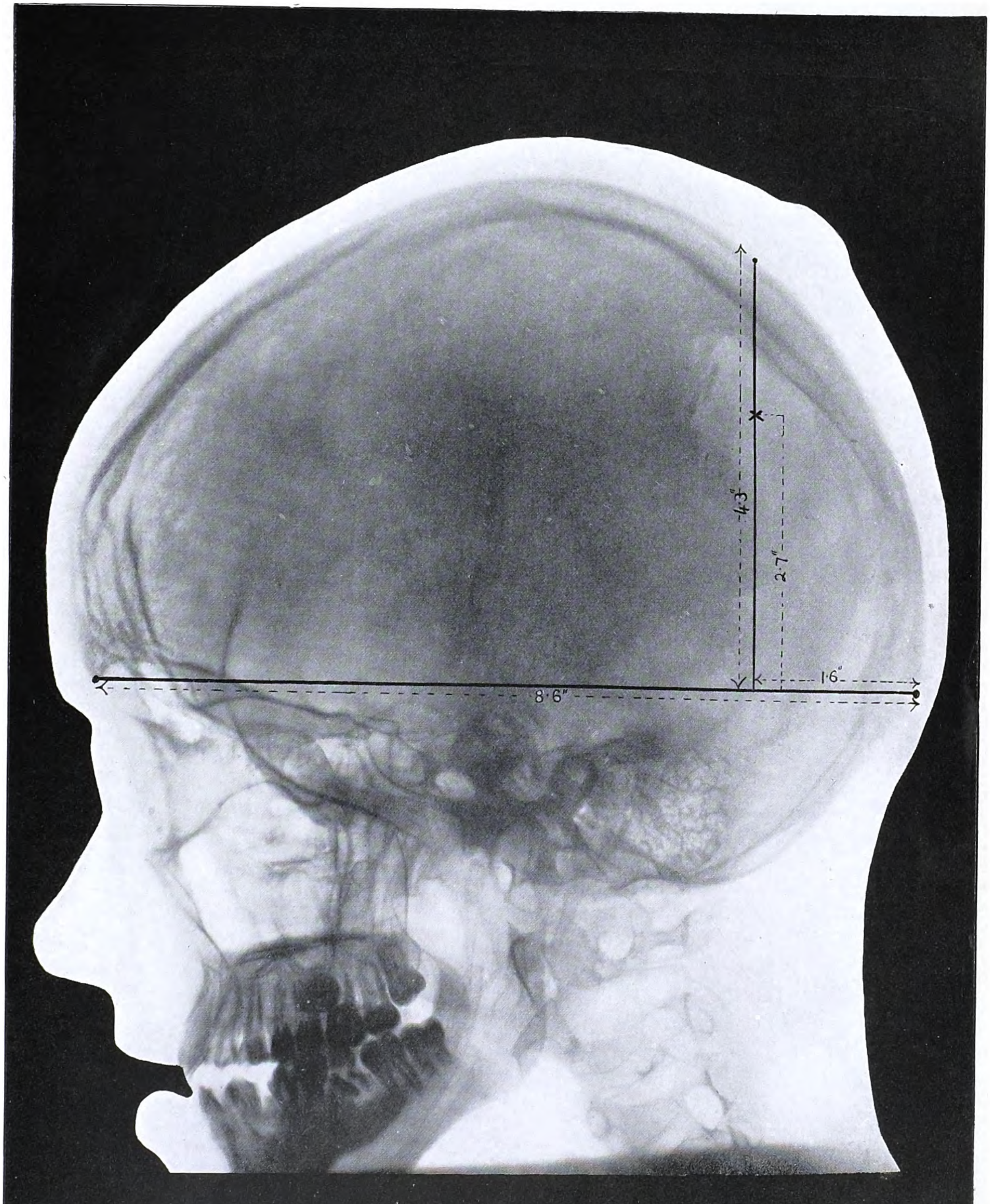
* H. L., a right-handed quarryman, age 23, was struck on the left side of the head by a large stone. On admission six hours later he was quite conscious, but had no recollection of the interval between the accident and his being placed in the ambulance, nor could he remember the accident.

Operation.—Ether was administered and an extensive scalp wound was cleaned. I exposed a depressed fracture of the parietal bone, some two inches from the interparietal suture and one inch anterior to the lambdoid suture. The fracture was extensively comminuted, with hairs lying between the fragments. The pieces were removed individually, exposing the brain, all trace of dura having disappeared. The cerebrum was lacerated and loose portions were swabbed away. The wound was closed without drainage in two layers, and 2000 units of antitetanic serum were given.

Clinical Localization.—On the day following operation the patient complained of periods during which he was unable to form words. He would break off in the middle of a sentence unable to continue, although obviously trying. On being given the word for which he was searching, he expressed relief and repeated it. Two days afterwards he was more fully examined. His speech had improved, but he experienced difficulty in naming objects, showing paraphasia, e.g., he called safety-pin 'single' and watch 'waa'. His power of reading was impaired; he was able to read verbs and nouns correctly, but manifested paralexia in the case of prepositions, adverbs, and conjunctions, with marked repetition of the word 'for'. He stated that he quite understood what he was reading and knew that he was making mistakes. Four days later his writing was examined. He made one mistake in giving his address, calling station 'shadown', and pointed to the word as being incorrect. Power of copying printed matter both in type and in writing was good. Reading was better than before, and dictation moderately well accomplished. No motor paralysis was evident, but the right abdominal reflex and left knee-jerk were less easily elicited than those of the opposite sides; visual field was normal.

Ten days afterwards his reading was almost normal, but still rather slovenly. The wound had almost healed and he had suffered from no headaches after the first few days.

The symptoms referring to the cortical lesion are: (*a*) Partial alexia; (*b*) Mild sensory aphasia; (*c*) Slight agraphia. They point to a lesion in the neighbourhood of the angular gyrus. The lesion cannot have been very deep, as hemianopia was absent. It is interesting to note that although the area of cortex involved was quite considerable, being 1½ by 1¾ inches in area, and although there was laceration of the brain, the symptoms were transitory in nature. The clinical findings were confirmed by the radiological. (*Brit. Jour. Surg.* 1923, *July.*)



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FRACTURES, continued.

Fig. 59.—SKULL: DEPRESSED FRACTURE OF VAULT. (*See Figs.* 13 *and* 14.)

The patient, a boy of 13, was struck on the head by a fall of stone. He was not rendered unconscious, and walked home. There was no wound. Four days later he noticed swelling of the scalp, and after two days more he was brought to the Infirmary, and admitted. On examination, the boy appeared normal in every way. He remembered all the facts about his accident. At operation a depressed fracture was exposed, and elevated. Convalescence was uneventful.

The firm attachment of the periosteum to the margins of the parietal bone has localized the swellings of the soft parts to that region, as in *Fig.* 58. A semicircular fracture is apparent in the parietal bone. Accurate localization with the key skull is possible, as an almost true lateral view has been obtained. At a point $2 \times 9{\cdot}1/7{\cdot}6 = 2{\cdot}4$ inches from the inion the centre of the fracture is $3{\cdot}1 \times 4{\cdot}6/4{\cdot}8 = 3{\cdot}1$ inches above the base line of the key.

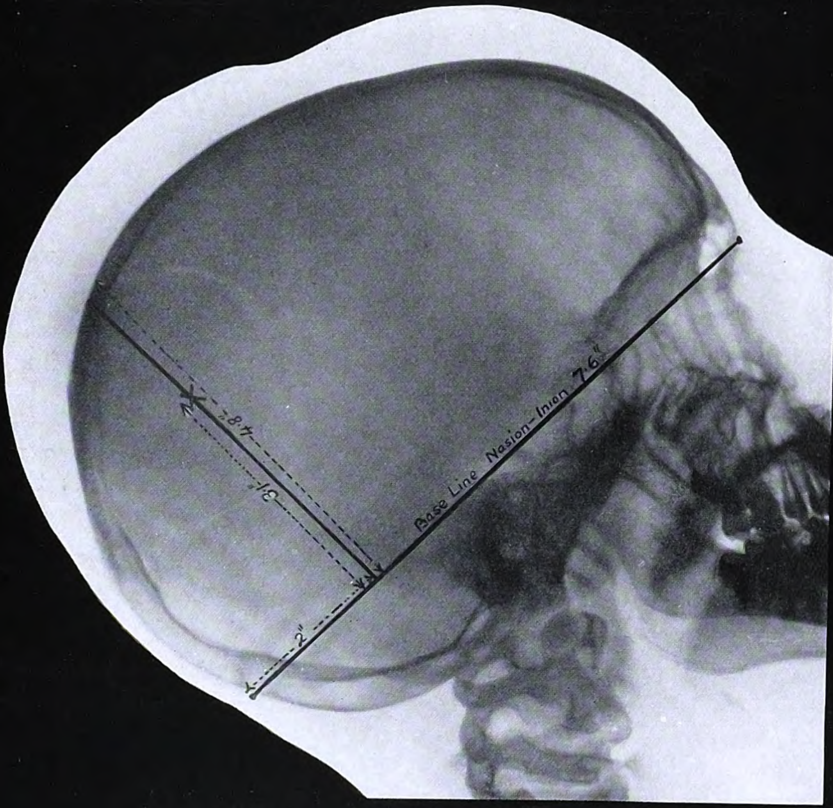
[*Mr. Collinson.*]

Fig. 60.—SKULL: DEPRESSED FRACTURE OF VAULT: BONE-GRAFTS. (*See Fig.* 14.)

As the result of a gunshot wound the patient sustained a depressed fracture of the vault. The fragments were elevated, leaving a wide gap in the occipital region. The patient suffered from severe headaches, and on bending down he felt his head would burst; he suffered from bitemporal hemianopia. As the symptoms grew worse, it was decided to put a series of bone-grafts in the defect. The operation was eminently satisfactory; all symptoms save the hemianopia disappeared, and he has had no return during the last two years.

Several pieces of bone are seen bridging the gap in the skull. The defect lies over the occipital lobe of the brain. A pure lateral view is not shown, so that accurate localization is impossible.

[*Mr. Dobson.*]



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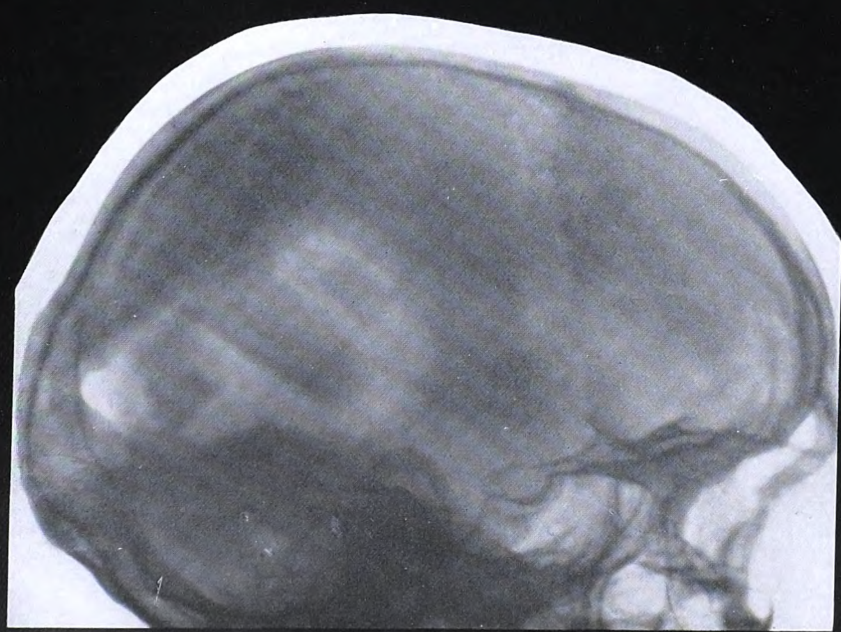

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FRACTURES, continued.

Fig. 61.—JAW : ANGLE. (*See Fig.* 14.)

This injury resulted from a blow on the chin during a boxing match. A fracture is seen extending from the angle upwards and forwards through the socket of the last molar tooth.

Fig. 62.—JAW : ANGLE. (*See Fig.* 15.)

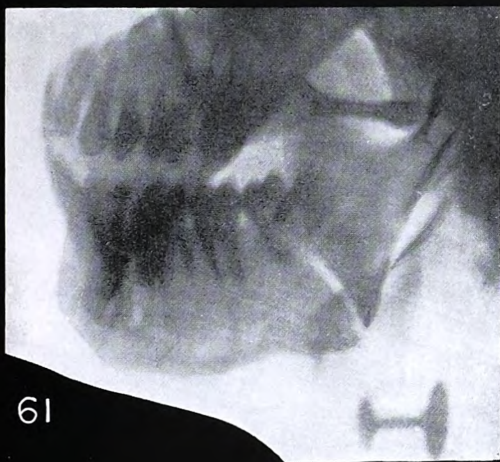
Note the marked surface prominence of the angle of the mandible. There is inward displacement of the body, following a fracture at the angle.

Fig. 63.—JAW : BODY. (*See Fig.* 14.)

A simple fissure is seen entering the socket of a tooth, which was recently extracted, and extraction was probably responsible for the fracture. Old periodontal inflammation is evidenced by the sclerosis of the floor of the socket.

Fig. 64.—JAW : BODY. (*See Fig.* 14.)

An oblique fracture of the body, midway between the angle and the symphysis, in an edentulous and atrophic mandible.



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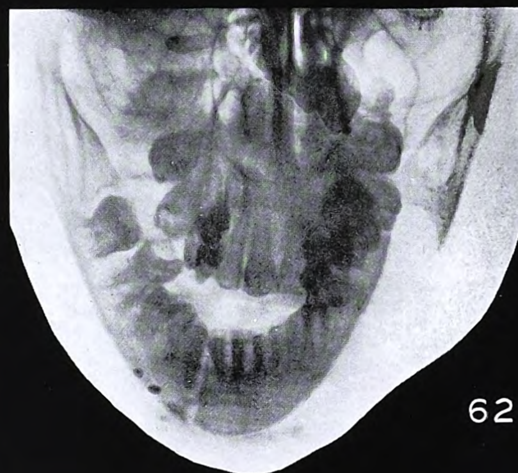

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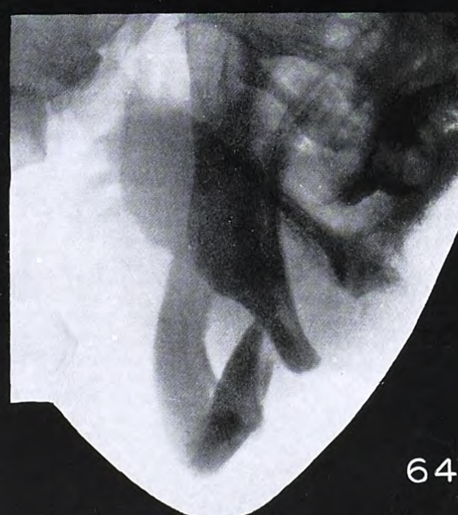

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FRACTURES, continued.

Fig. 65.—Clavicle : Middle : Greenstick Fracture. (*See Fig.* 41.)

Observe the steep rise of the contour of the neck above the outer extremity of the clavicle due to depression of the outer fragment. The middle of the bone is the seat of fracture. The periosteum has not been ruptured ; thus apposition is not lost.

Fig. 66.—Clavicle : Middle. (*See Fig.* 16.)

Note the loss of the usual gentle sweep of the shoulder. The inner fragment is raised by the sternomastoid, and the outer adducted by the pectoralis major and latissimus dorsi, and depressed by the weight of the arm.

Fig. 67.—Clavicle : Middle. (*See Fig.* 16.)

Treated by supporting the point of the elbow and drawing the arm outwards and backwards (Sayre's method). Note the good alinement obtained. Compare the gentle gradient of the shoulder with the steepness in *Figs.* 65 *and* 66, where the fragments were in bad position. (N.B.—This was not the case shown in *Fig.* 66.)

Fig. 68.—Clavicle : Inner End. (*See Fig.* 27.)

The fracture is near the sternal articulation. The inner portion has been drawn up somewhat by the sternomastoid muscle, and the outer downwards as the result of the weight of the arm.

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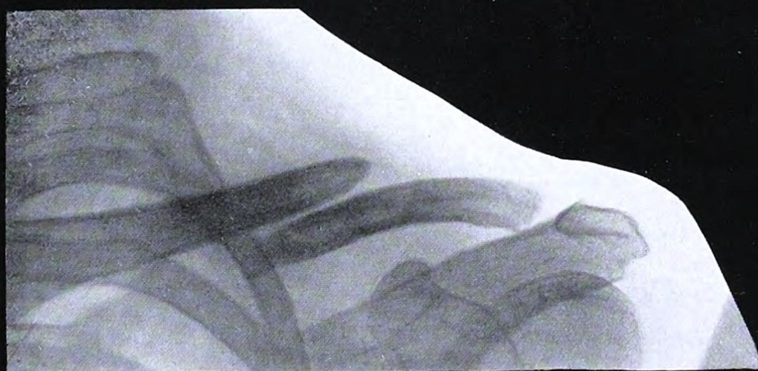

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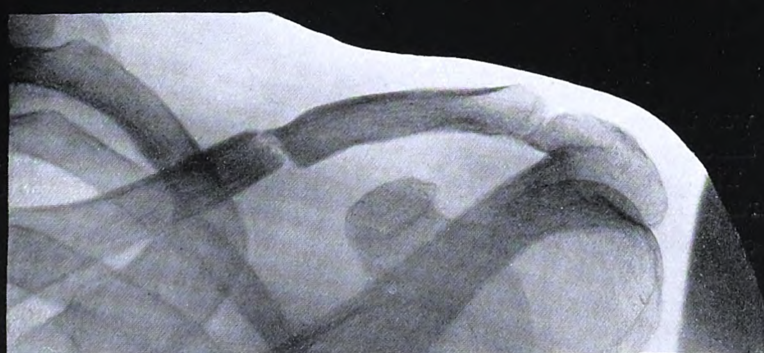

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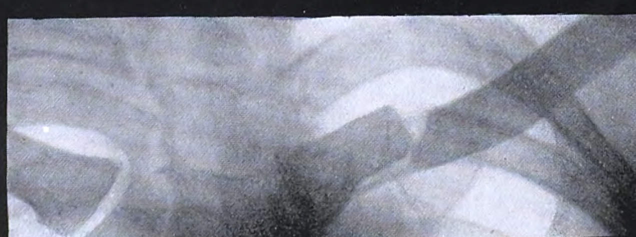

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FRACTURES, continued.

Fig. 69.—Scapula : Acromion. (*See Fig.* 16.)

The acromion has been fractured, probably as the result of direct violence.

Fig. 70.—Scapula : Glenoid Fossa. (*See Fig.* 16.)

The lower part of the glenoid fossa has been separated from the rest of the scapula.

Fig. 71.—Scapula : Axillary Border. (*See Fig.* 16.)

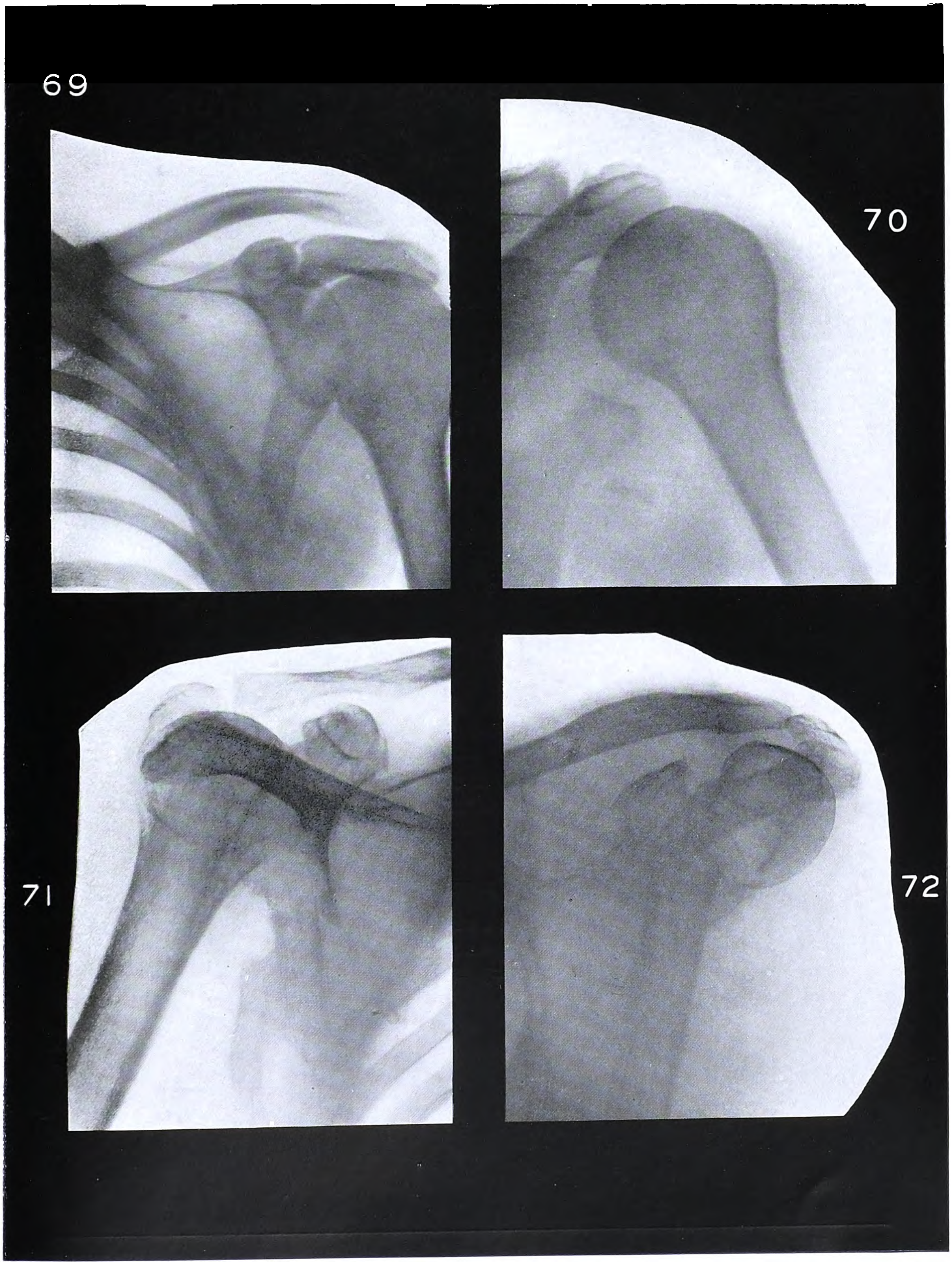
A fracture, possibly comminuted, of the axillary border of the scapula, in a man of 71, caused by a blow from a poker during a domestic 'argument'. Senile atrophy of the bones is apparent.

Fig. 72.—Humerus : Neck. (*See Fig.* 16.)

This was the result of a fall on the arm, and occurred in a woman of 57.

The silhouette emphasizes a marked swelling of the soft parts below the fracture. This was due in part to the shortening, and in part to compression of the parts below by the bandage.

The outline of the glenoid fossa is visible. The upper end of the lower fragment lies beneath the coracoid process. The head of the humerus is approximated to the acromion, and its articular surface appears to look outwards.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FRACTURES, continued.

Fig. 73.—Humerus : Surgical Neck. (*See Fig.* 16.)

The man, age 53, fell from his bicycle, and hurt his shoulder. Examination showed no external irregularities. Movement was painful, but fairly free. X rays revealed an impacted fracture of the neck. It was treated by fixation of the arm to the chest for ten days and a sling for a similar period, with an excellent result.

Fig. 74.—Humerus : Surgical Neck. (*See Fig.* 16.)

Observe the irregular fracture of the surgical neck, with the usual adduction of the lower fragment, due to the muscles attached to the bicipital groove.

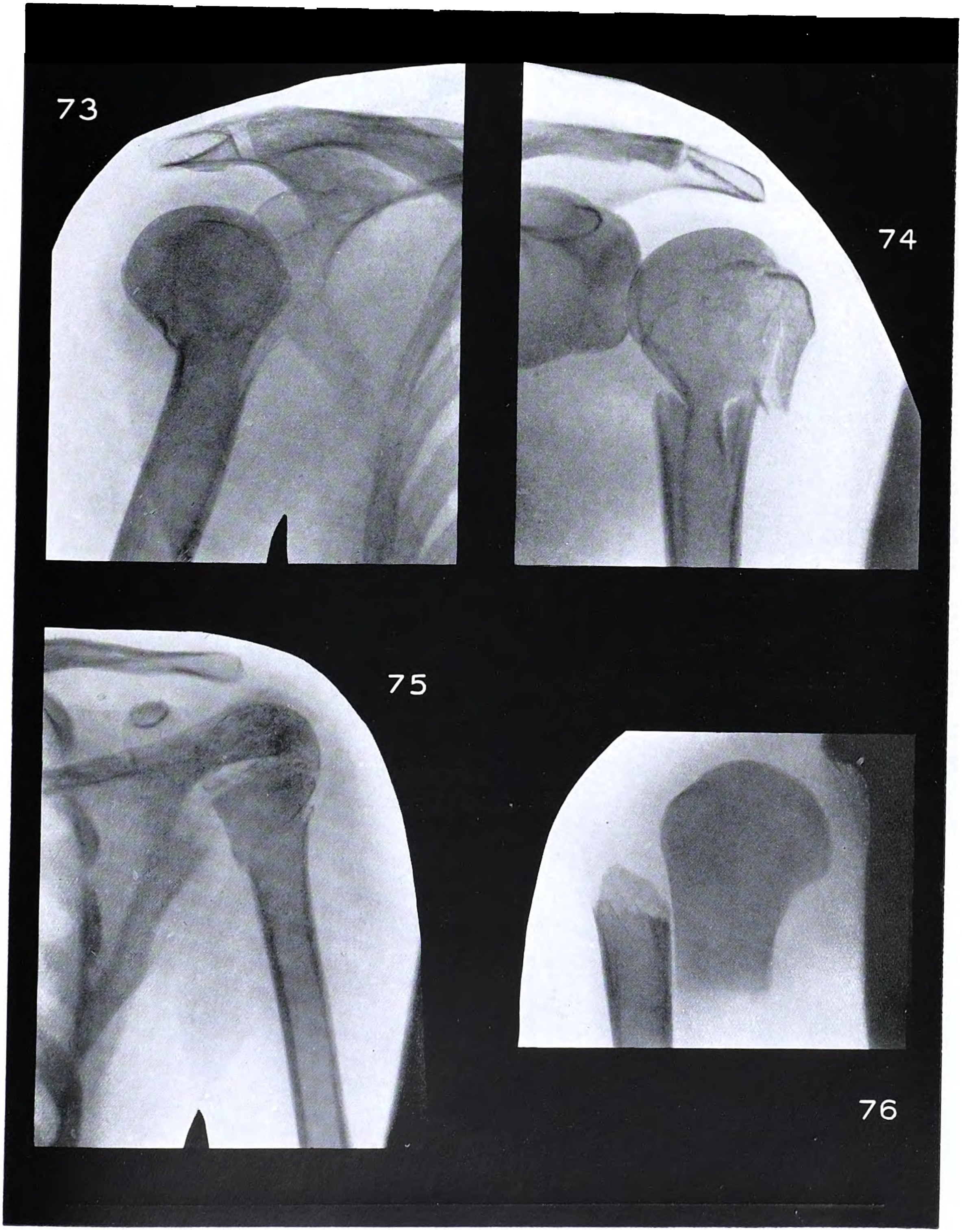
Fig. 75.—Humerus : Surgical Neck. (*See Fig.* 41.)

An oblique fracture of the humerus in a boy of about 13 years of age. The displacement of the lower fragment may have been prevented by the obliquity of the fracture, but it is possible the periosteum has not ruptured.

Note that in *Figs.* 74, 75, and 76 there is no flattening of the shoulder, nor increase in axillary girth, as in dislocation (*see Fig.* 8).

Fig. 76.—Humerus : Upper Third. (*See Fig.* 16.)

The upper fragment is adducted owing to the action of the chest muscles, whilst the lower is drawn upwards by the deltoid and other muscles. The fracture has a certain obliquity which may have determined the position.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FRACTURES, continued.

Fig. 77.—Humerus : Shaft : Lower Third : Comminuted. (*See Fig.* 18.)

The main fragments are not in apposition, but ossifying callus bridges the gap between them in front, and a detached fragment behind. Note the angular deformity, due to the brachialis anticus and triceps muscles.

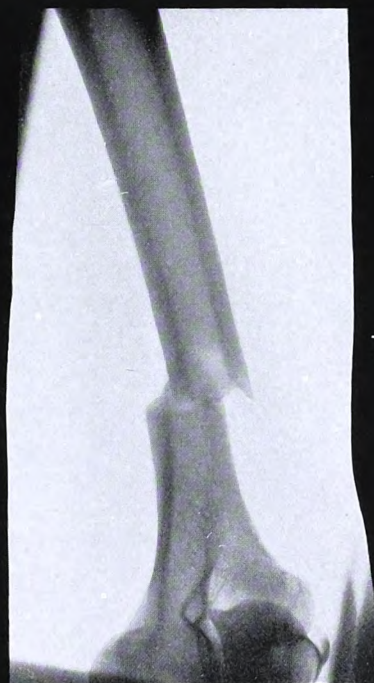
From the fact that the callus is opaque to X rays it must be at least two weeks old.

Fig. 78.—Humerus : Shaft : Lower Third. (*See Fig.* 17.)

The shaft is broken in its lower third.

Fig. 79.—Humerus : Shaft : Middle Third. (*See Fig.* 43.)

Fracture of the shaft in a child about 11 years old.



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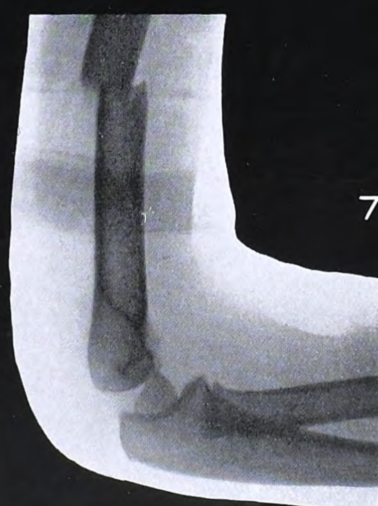

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FRACTURES, continued.

Fig. 80.—Humerus : Lower Third. (*See Fig.* 18.)

The break is situated somewhat lower than in *Fig.* 78. The obliquity of the fracture probably explains the position of the fragments.

Fig. 81.—Humerus : Supracondylar. (*See Fig.* 18.)

The surface contour shows characteristic prominences anteriorly and posteriorly. The sharp lower end of the upper fragment projects anteriorly, and if left is liable to interfere with flexion. The treatment consists in full flexion, but only after reduction has been carried out.

In all fractures of this type there is a marked tendency to the onset of myositis ossificans (*see Fig.* 150), and a special danger of this treatment by flexion is the possible development of ischæmic contraction.

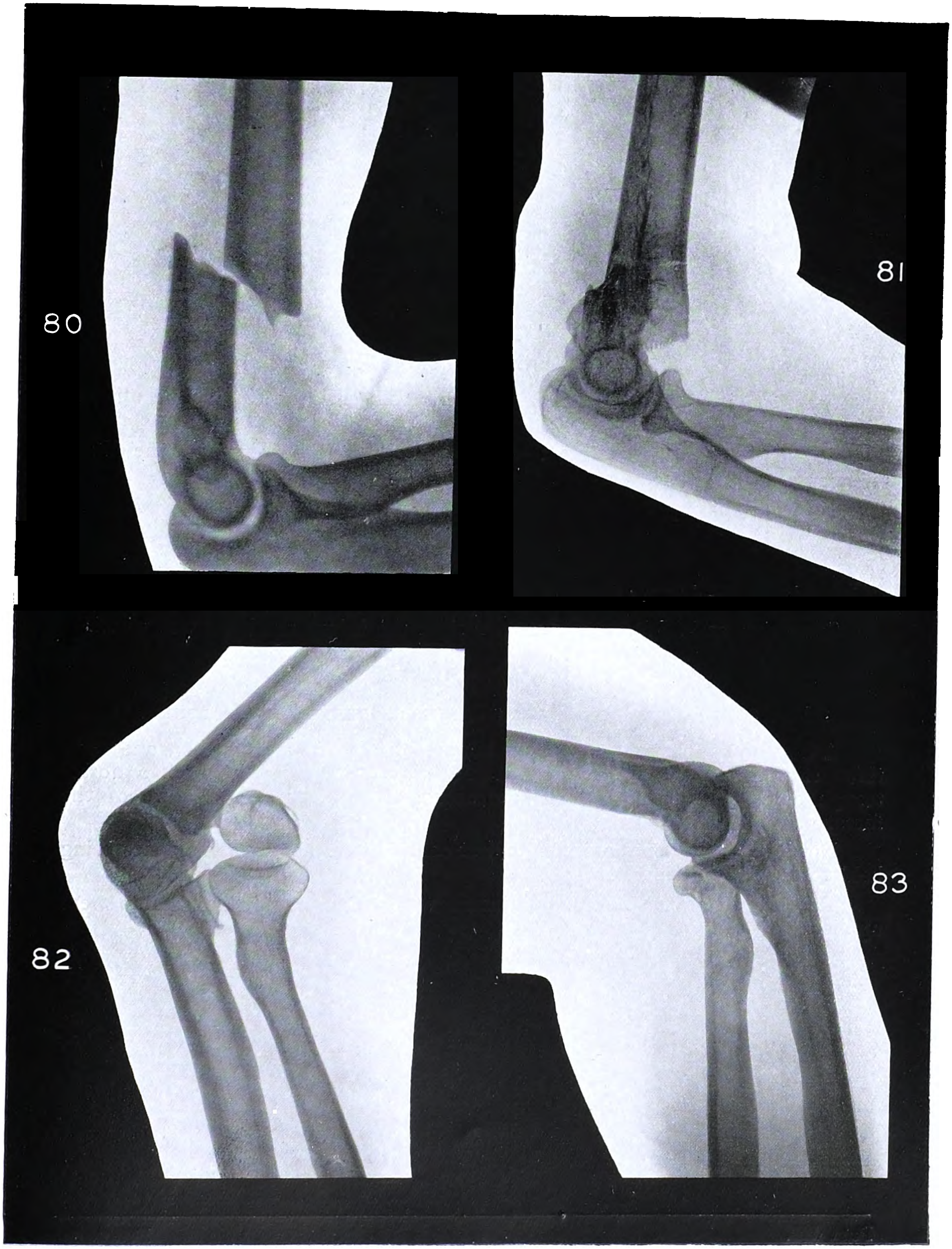
Fig. 82.—Humerus : External Condyle. (*See Fig.* 18.)

The external condyle has been separated from the rest of the humerus. Union has not occurred, and the fragment has been carried away, together with the radial articulation.

The cause was probably a fall on the hand, the force being transmitted via the radius.

Fig. 83.—Radius : Head. (*See Fig.* 18.)

There is a fracture of the anterior part of the head of the radius, which necessitated open operation and removal of the fragment.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FRACTURES, continued.

Fig. 84.—Ulna : Olecranon. (*See Fig.* 18.)

The olecranon has been completely separated from the rest of the ulna, a wide gap intervening.

Note how, in this case, flexion—the treatment for most injuries of the elbow—increases the distance between the fragments.

[*Mr. Thompson.*]

Fig. 85.—Ulna : Olecranon : After Wiring. (*See Fig.* 18.)

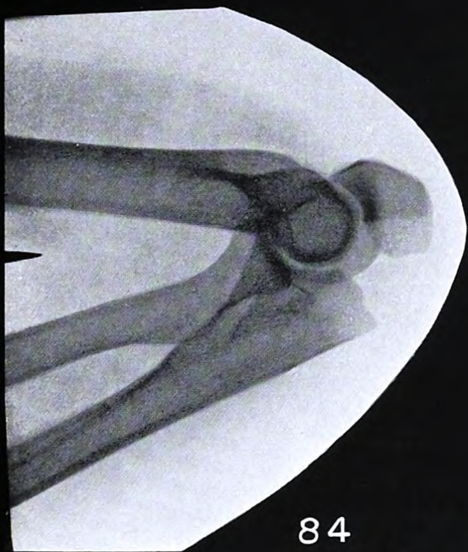
Same case as in *Fig.* 84. Ten days after the injury the bone was wired.

Fig. 86.—Radius and Ulna : Shafts : Greenstick Fracture.

A boy of 14 fell, and came complaining of loss of use and pain, and with this deformity, which may be called the 'wave' deformity. It has a dorsal trough and ventral crest, and is characteristic of greenstick fracture of the forearm.

Note that both bones are broken, but continuity is not lost, the bones being held together by periosteum.

Restoration of the normal alinement was accomplished, and splints were applied.



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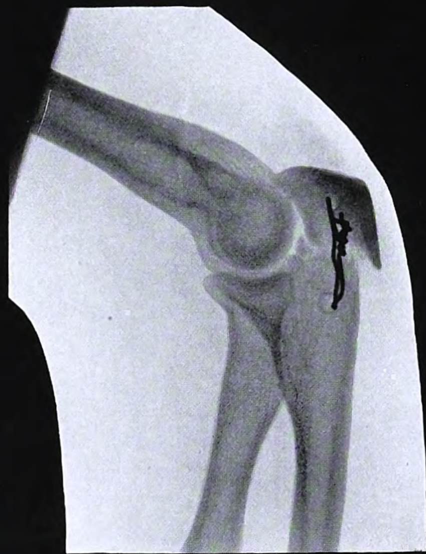

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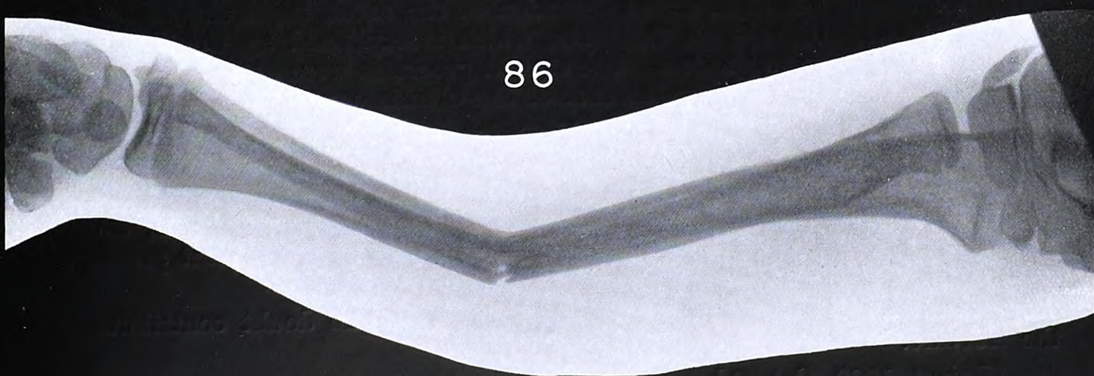

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FRACTURES, continued.

Fig. 87.—Radius and Ulna : Shafts. (*See Fig.* 20.)

Observe the abnormal concavity on the ulna border of the hand due to a fracture of the radius and ulna. The ulna is comminuted and its lower fragment is almost touching the radius.

The cause was probably direct violence. If reposition is not effected, there will be great danger of cross-union, the callus from both bones fusing together (*see Fig.* 141.)

Fig. 88.—Radius and Ulna : Shafts. (*See Fig.* 20.)

Note a marked prominence above the wrist due to the upper fragment of the radius. The lower fragment is pronated and adducted towards the ulna by the pronator quadratus. The ulna is broken, but continuity is not lost.

The bones being broken at a different level, unlike the previous case, the cause of the break was indirect violence, as by falling on the hand.

Figs. 89, 90.—Radius : Colles's Fracture. (*See Figs.* 19 *and* 20.)

Antero-posterior view, and lateral view.

The patient, a woman of 49, fell, and to break the fall put out her hand. The impact on her hand occasioned severe pain and loss of use.

There was well-marked radial deviation of the hand, beginning just above the wrist, as can be seen on the plate, which is explained by the shortening of the radius due to impaction. The styloid processes were at the same level; this sign is not always present, as that of the ulna is occasionally broken.

The hand and arm were bent in the 'dinner-fork' position, at a point one inch above the wrist-joint. This deformity is obviously due to backward displacement of the lower end of the radius. It is very necessary to correct this, as the lower fragment tends to interfere with the extensor tendons, causing the wrist to drop. Moreover, altered stresses and strains in a joint predispose to osteo-arthritis in later life.

Note the rarefied condition of the bones, which no doubt contributed to the fracture.

[*Lancet*, 1923, Oct. 6.]

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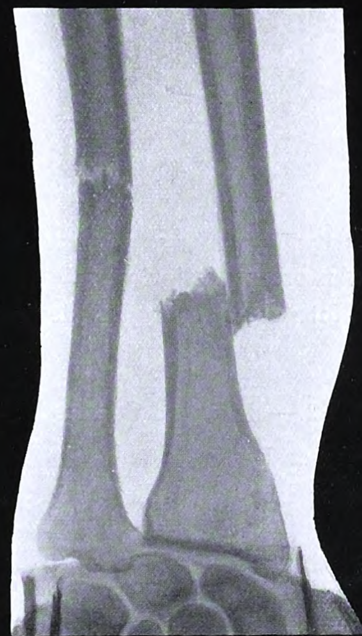

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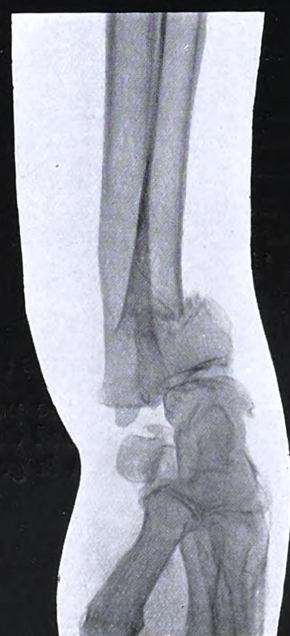

FRACTURES, continued.

Fig. 91.—RADIUS: COLLES'S FRACTURE: AFTER TREATMENT. (*See Fig.* 20.)

Antero-posterior view.

Note that the radial deviation has been largely obliterated.

Fig. 92.—RADIUS: COLLES'S FRACTURE: AFTER TREATMENT. (*See Fig.* 19.)

Lateral view.

The backward displacement has been corrected.

Fig. 93.—RADIUS: CHAUFFEUR'S FRACTURE. (*See Fig.* 20.)

Antero-posterior view.

This fracture, in a man, age 19, was caused by the backfire of a car, the crank being held between the finger and thumb. Great pain and loss of use followed.

Note the absence of skin deformity. The end of the radius shows an oblique fracture, commencing half an inch above the styloid process, and ending about the middle of the joint. The force of the blow has been transmitted from the thumb via the trapezium and scaphoid to the radius. The great pain is due to the fracture extending to the joint, movement of which is impossible without the fragments grating.

This fracture only occurs as the result of this particular accident, just as fracture of the astragalus has only become frequent with the advent of the aeroplane 'joy stick'.

Fig. 94.—RADIUS: SMITH'S FRACTURE. (*See Fig.* 19.)

This was caused by the patient falling with his "arm under him". It is the opposite of the backward deformity of a Colles's fracture. [It appears to be much more common than is generally supposed.—A.P.B.]

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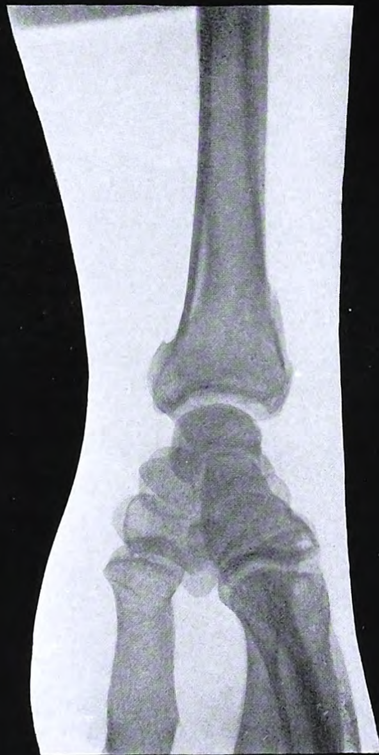

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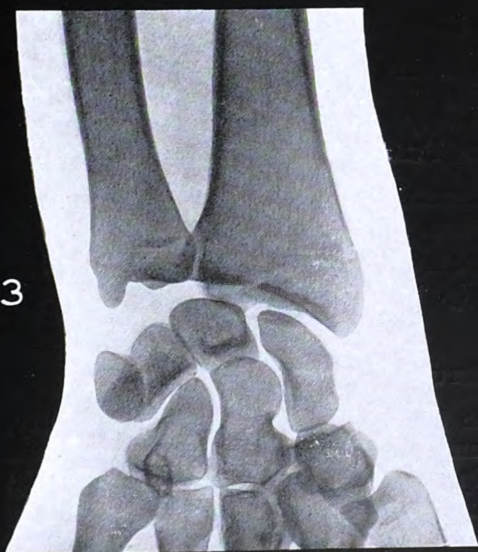

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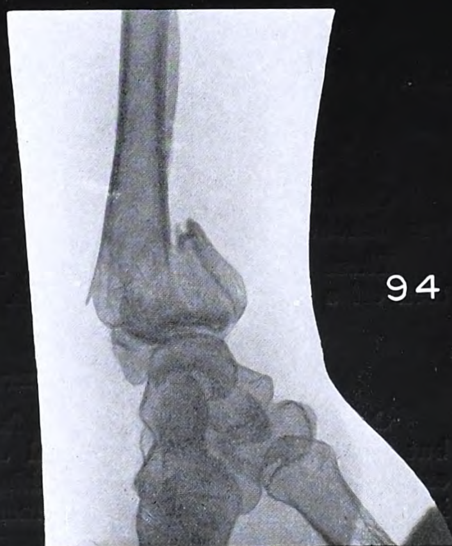


FRACTURES, continued.

Fig. 95.—Epiphysis of First Metacarpal. (*See Fig.* 44.)

The patient, a boy of 13, sustained a blow on the thumb. Undue mobility and pain at the base of the thumb were noted.

A separated epiphysis, with fracture, of the first metacarpal is apparent; the distal portion is displaced backwards; part of the diaphysis has remained with the epiphysis.

Treatment, consisting of reduction of the deformity and the use of a grooved splint, proved successful.

N.B.—The anterior-posterior view was normal in appearance, thus emphasizing the need for screening in two portions.

Fig. 96.—Impacted Fracture of First Metacarpal. (*See Fig.* 4.)

There is an impacted stave fracture of the base of the thumb, probably the result of a force transmitted up the thumb.

Fig. 97.—Scaphoid. (*See Fig.* 20.)

A complete fracture is seen crossing the 'waist' of the scaphoid. It occurred a year before, and was still causing pain and weakness.

The most successful treatment is removal of the loose fragment.

Fig. 98.—Phalanx. (*See Fig.* 4.)

A comminuted fracture of the second phalanx is seen.

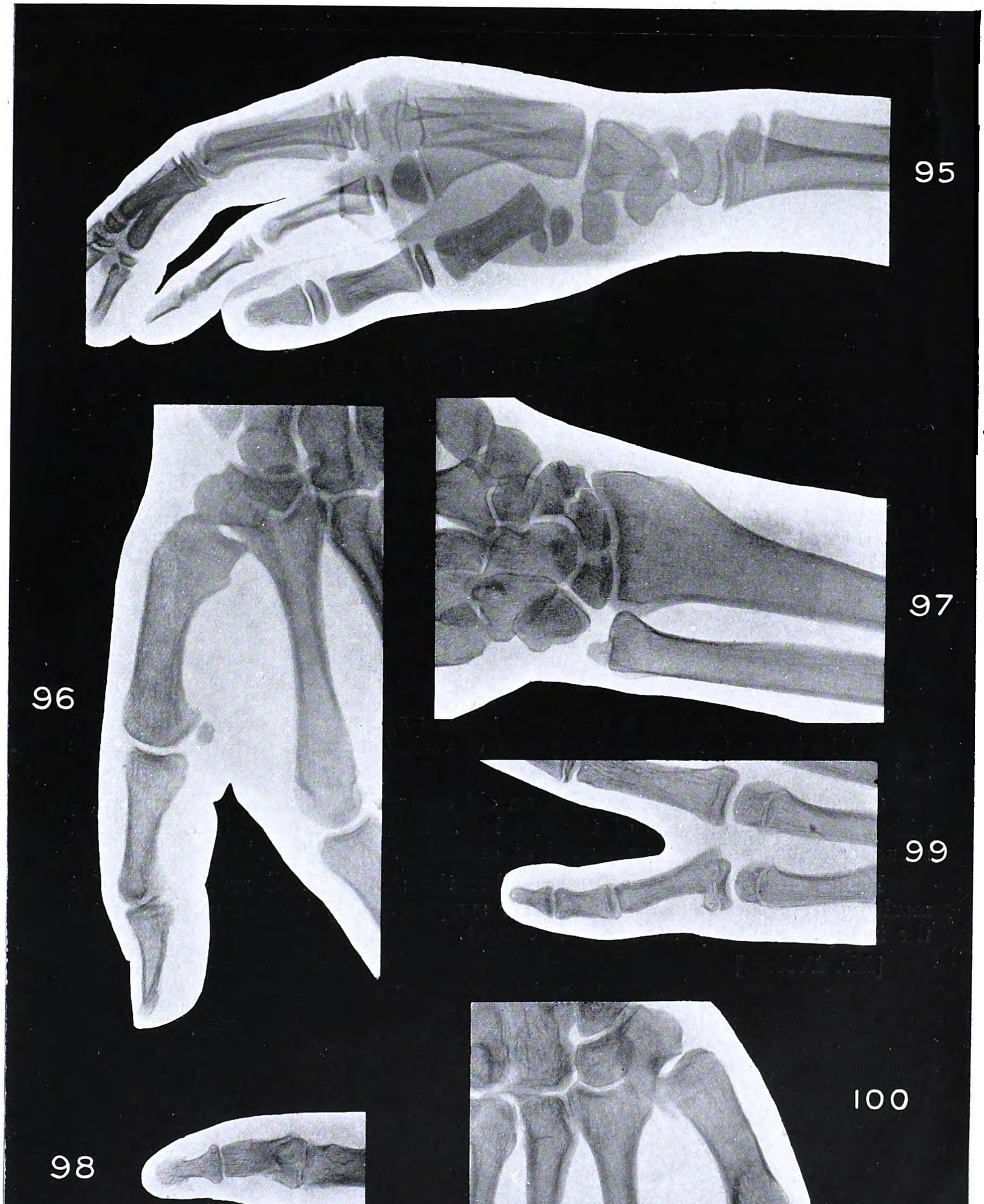
Fig. 99.—Separated Epiphysis of Phalanx. (*See Fig.* 42.)

Clinically the condition simulated an inward dislocation, but the diagnosis was clinched by the detection of soft crepitus.

There has been a separation of the epiphysis of the phalanx, which has torn off a wedge of the diaphysis. (*See Fig.* 128.)

Fig. 100.—Bennett's Fracture. (*See Fig.* 4.)

Occurred as the result of a fall on the thumb. There was no deformity, but intense pain. The essential of a Bennett's fracture is an oblique crack extending into the joint, detaching a chip of bone. The cause of the pain is the impossibility of any movement of thumb, index, or wrist without rubbing of the bone surfaces (cf. Chauffeur's Fracture, *Fig.* 93).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FRACTURES, continued.

Fig. 101.—Pelvis. (*See Fig.* 21.)

The patient, a woman, age 57, of unsound mind, jumped out of a window. Signs of fractured pelvis were manifest, but with no rectal or vesical complications.

The acetabular portion of the pubis has been separated from the rest of the bone by a fracture. The conjoined rami have been parted, and the ischial part rotated—probably by the adductor muscles. A third fracture passes across the acetabulum, separating the ischium from the ilium.

[*Mr. Collinson.*]

Fig. 102.—Pelvis. Vesical Calculus also present. (*See Fig.* 49.)

The patient sustained a fractured pelvis some months before. Since the accident he had suffered from symptoms of vesical disease, which were thought to be due to spinal injury.

On admission, X rays revealed an old separation of the symphysis pubis, with upward displacement of the left half. Above the pubis is seen a large round calculus, which was removed at operation.

It is a matter of conjecture whether the stone formed round blood-clot resulting from the accident, or whether symptoms only became manifest after the injury. Probably the latter is correct.

[*Mr. Dobson.*]

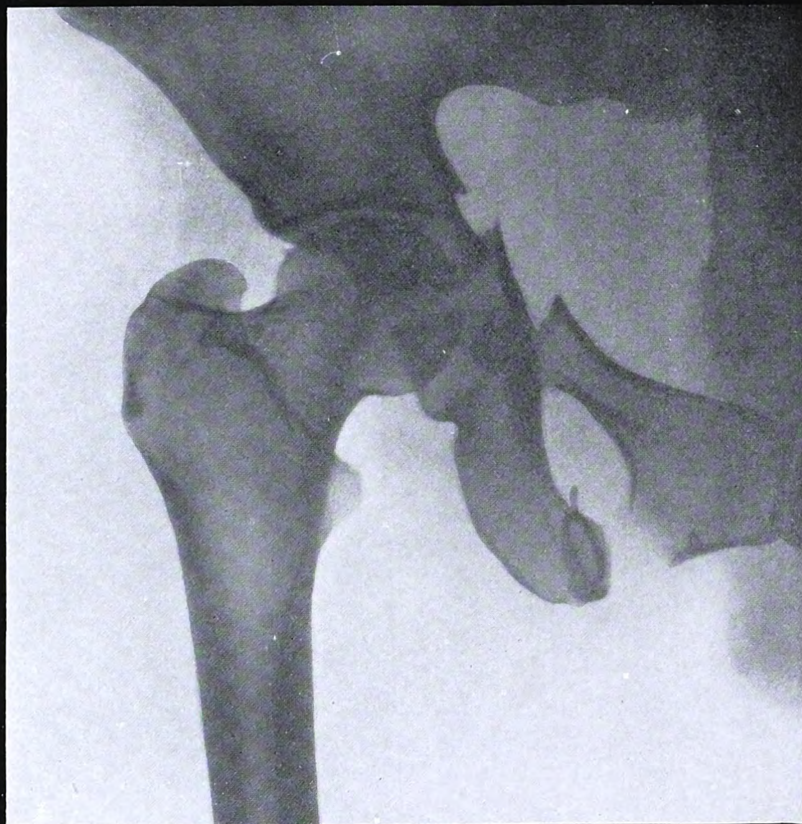

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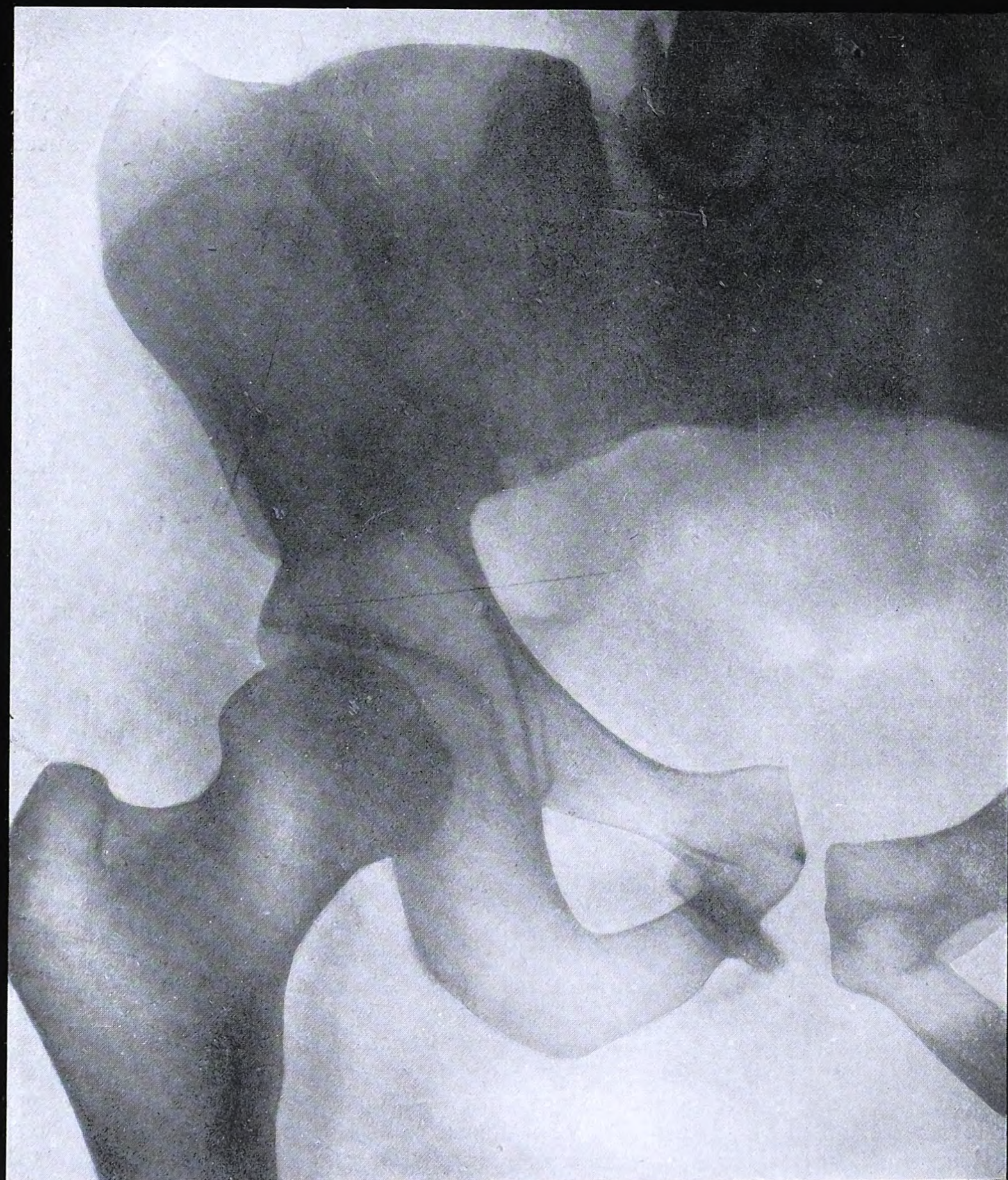
Fig. 103.—PELVIS: SEPARATION OF SYMPHYSIS PUBIS. (*See Fig.* 49.)

The symphysis has been torn asunder and the right side has become raised. A large flake of the pubis on the injured side is separated from the rest of the bone. The lower border of the pubis on that side lies at the level of the upper border of the opposite side.



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FRACTURES, continued.

Fig. 104.—Femur : Neck : Extracapsular. (*See Fig.* 21.)

The fracture of the neck is near its junction with the shaft. Whilst the head of the bone has remained *in situ*, the shaft has been drawn up, so that the upper border of the great trochanter almost touches the ilium. This has caused a condition of coxa vara.

As can readily be seen, these fractures are accompanied by a maximal amount of shortening of the limb, unlike the intracapsular (*see Fig.* 105).

Fig. 105.—Femur : Neck : Intracapsular. (*See Fig.* 21.)

As the result of a stumble from the curbstone the patient collapsed, but with great pain succeeded in limping home.

X rays demonstrated a fracture of the neck of the bone, considerably nearer the head than in *Fig.* 104. The shaft is inverted, so that the digital fossa is not seen.

Mark the rarefied condition of the bone, which predisposed to the fracture.

Fig. 106.—Femur : Shaft : Upper Third. (*See Fig.* 21.)

A somewhat oblique fracture of the upper third of the femur is present. Note the marked abduction of the upper fragment due to the pull of the gluteal muscles. Adduction of the limb is associated with flexion (iliopsoas) and external rotation (obturator externus and internus, gemelli and quadratus femoris, none of which can be seen in the skiagram).

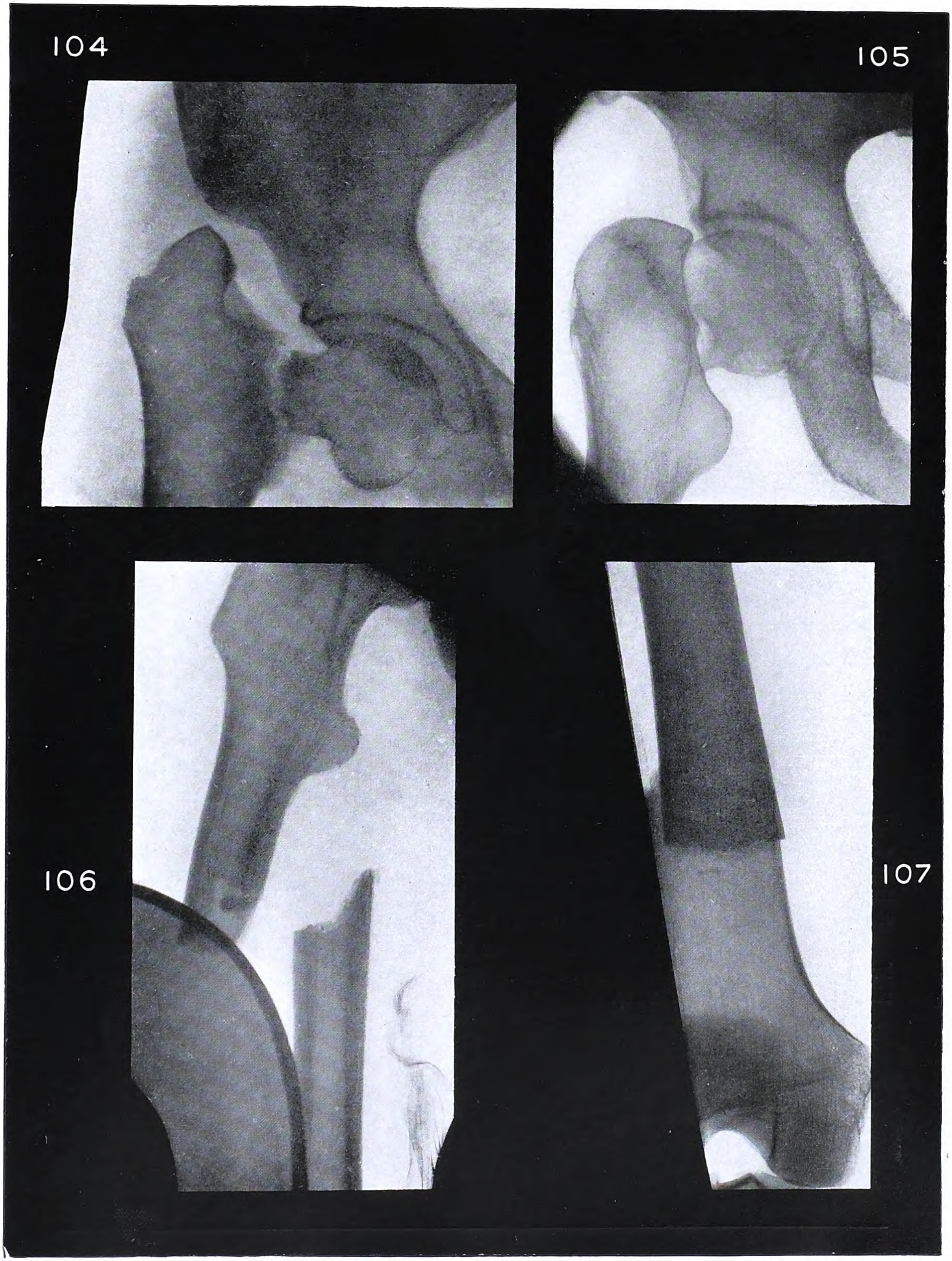
A gutter splint has been applied, but it is obvious how necessary is abduction of the limb for these fractures (*see Fig.* 137).

Fig. 107.—Femur : Shaft : Lower Third. (*See Fig.* 23.)

A transverse fracture with an inch overlapping of the two ends. The shortening, when the two ends are not in apposition, is due to the action of the rectus femoris and the hamstrings. The gastrocnemius may influence the backward displacement of the lower fragment.

In these fractures, especially when somewhat lower than this one, the upper or lower end of the bone projects into the ham, and in doing so may compress or tear the popliteal artery, with grave consequences.

Treatment is by weight extension and flexion, after reduction has been effected.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FRACTURES, continued.

Fig. 108.—Femur : Shaft : Bec-de-Flûte : Recent.

Occurred in a boy of 8. It is a torsion fracture of the 'bec-de-flûte' variety, about the middle of the femur.

Fig. 109.—Femur : Shaft : Old.

This fracture occurred some four weeks previously. Note the prominence on the outer side of the thigh due to the underlying fracture.

X rays demonstrate a fracture with faulty alinement. The ends of the bone, previously like those in *Fig.* 108, are now rounded off. There is a mass of callus on the outer side of the lower fragment. In spite of the angulation, the femur, by a process of moulding, is tending towards the normal. The cancellous tissue is adjusting itself at the point of apposition of the bones. Such a femur will always show an abnormal internal curvature, but with growth it will tend to be less obvious.

Fig. 110.—Femur : Injury of Lower Epiphysis : Traumatic Genu Valgum. (*See Fig.* 54.)

Occurred in a girl, age 13. The condition developed some months after a fall in the school playground. Notice the marked projection on the inner side of the knee. The inner part of the lower epiphysis of the femur is normal, whilst the outer part is indefinite and its depth much reduced. Thus, to maintain the contact of the bones the leg has projected laterally. Note the shadow of the patella, which bone is in danger of outward dislocation.

There is a marked spur of bone at the site of the insertion of the internal lateral ligament on the tibia. This projection is of frequent occurrence in rickety legs (*see Fig.* 202).

[*Mr. Daw.*]

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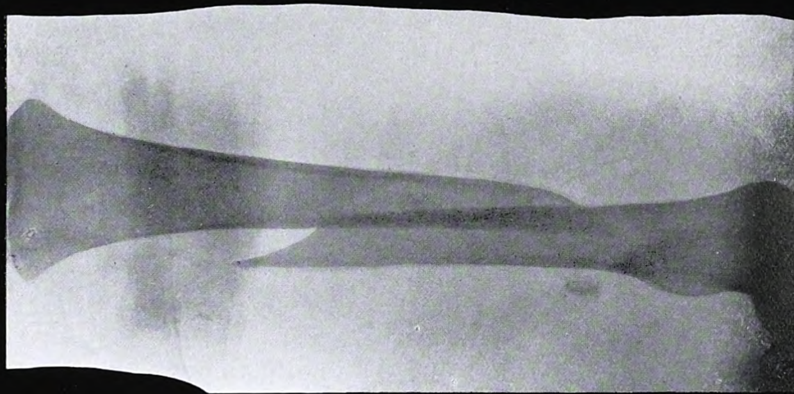

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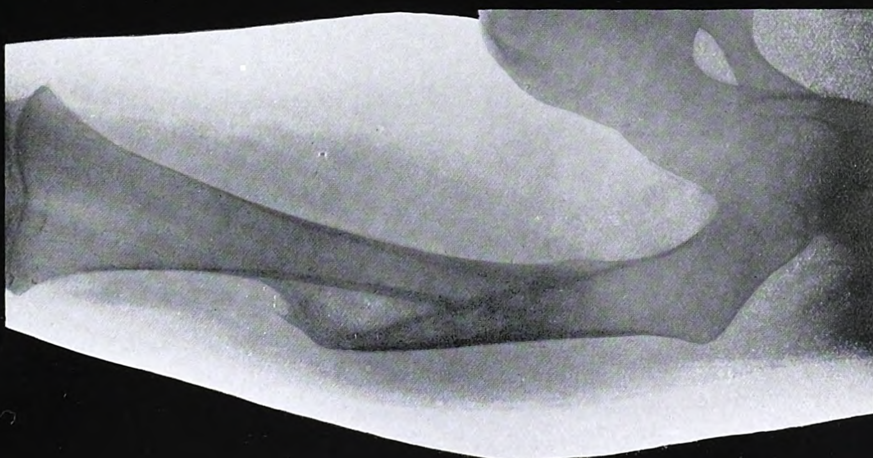

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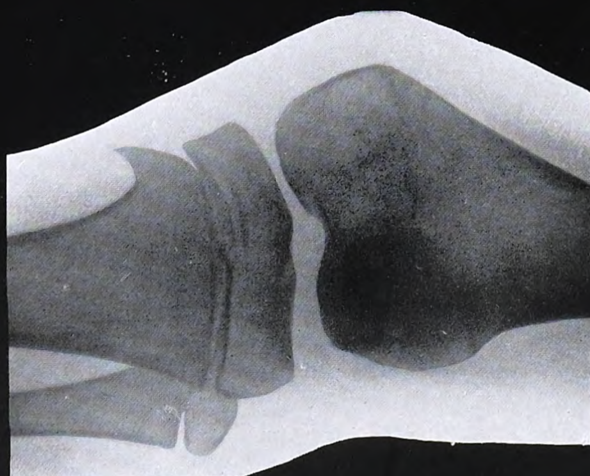


FRACTURES, continued.

Fig. 111.—Loose Body in Knee-joint, resulting from Fracture. (*See Fig.* 22.)

Note a round ossified body in the joint. In the absence of other disease in the joint it must be surmised that it took origin in a bony flake torn off as the result of an accident.

Fig. 112.—Ruptured Ligamentum Patellae. (*See Fig.* 22.)

Note the great distance between the patella and the tubercle of the tibia. A small piece of the front of the tibia above the tubercle has been torn away.

Fig. 113.—Patella. (*See Fig.* 22.)

In this case, there was the usual history of sudden effort at extension, followed by collapse and inability to extend the limb.

Note the transverse groove on the surface over the site of the patella.

The two fragments of the patella are separated by a wide gap, and the lower one is rotated so that its fractured surface is directed forwards.

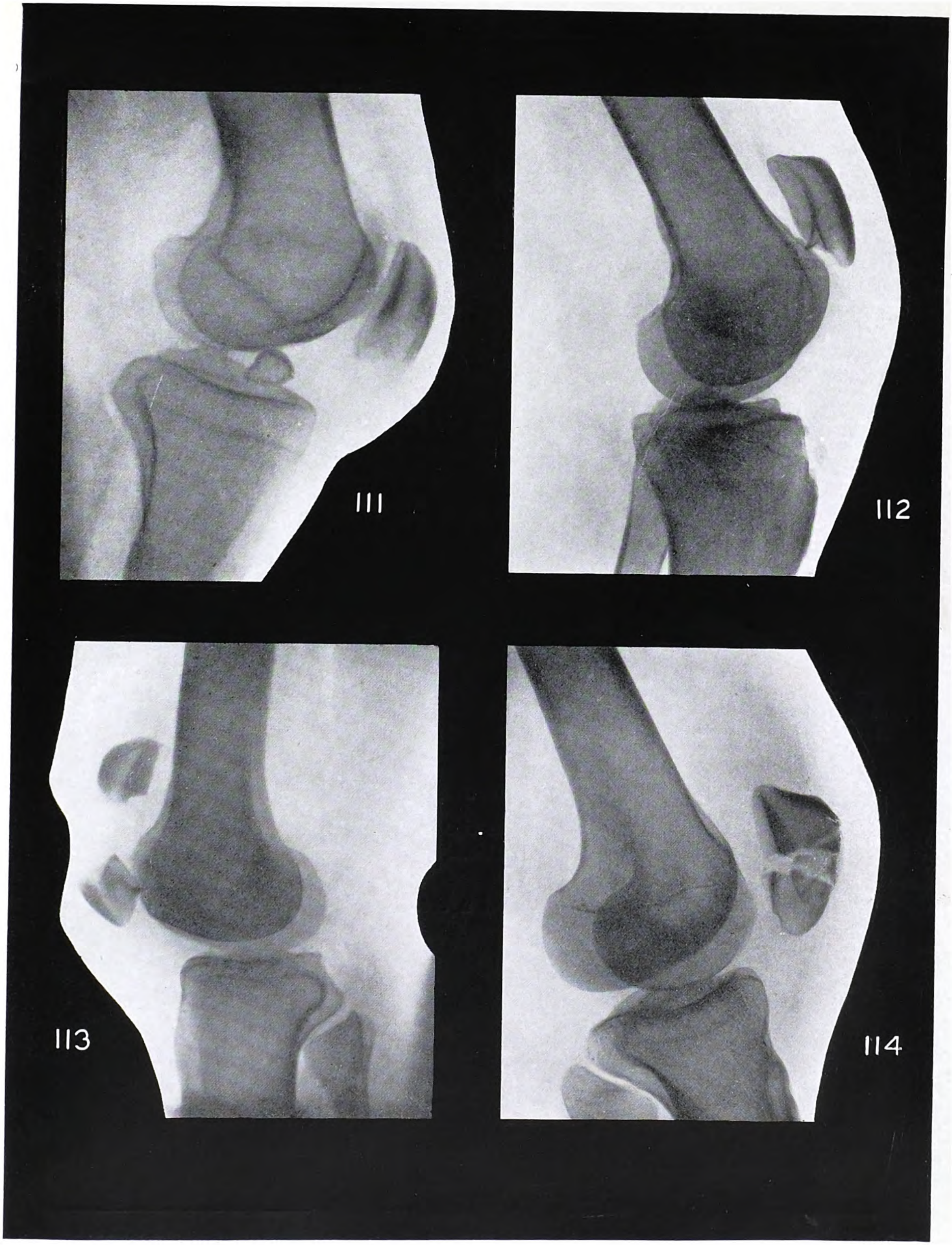
[*Mr. Thompson.*] [*Lancet*, 1923, Oct. 6.]

Fig. 114.—Patella. (*See Fig.* 22.)

This was due to direct violence.

Note the normal contour of the limb, save for some swelling.

The patella is the site of a stellate fracture. Very little separation has occurred, owing to the dense periosteal and tendinous covering remaining intact. The separation of the patella from the femur indicates the presence of fluid in the joint.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FRACTURES, continued.

Fig. 115.—Tibia and Fibula : Shafts : Impacted. (*See Fig.* 23.)

An impacted fracture of the tibia with comminution ; there is also a fracture of the fibula.

It has every appearance of having been caused by a fall on the foot with the knee extended. The real cause was a heavy drum rolling against the leg.

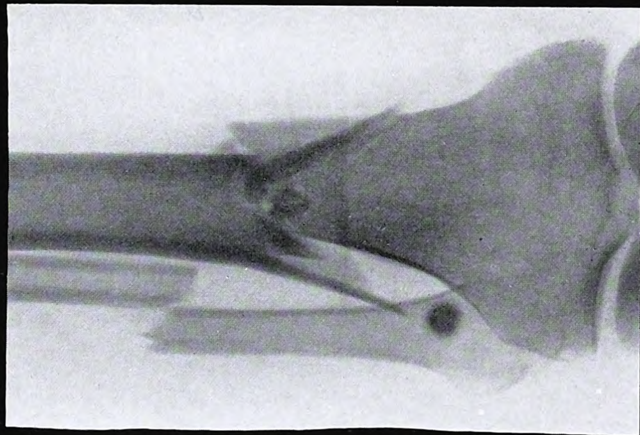
Fig. 116.—Tibia and Fibula : Shafts : Bec-de-Flûte.

There is a fracture of the 'bec-de-flûte' variety of both tibia and fibula, with some overlapping in both cases. The manner in which the bones are fractured points to torsion being the cause.

Fig. 117.—Fibula : Shaft.

The patient complained of pain on the outer side of the leg when walking, following a blow there. On examination, attempts at 'springing' the bone were unsuccessful and painful.

The fibula is seen to have suffered a comminuted fracture.



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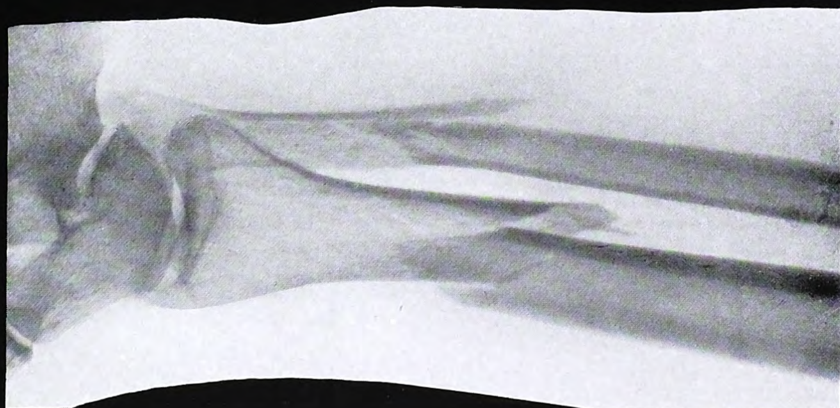

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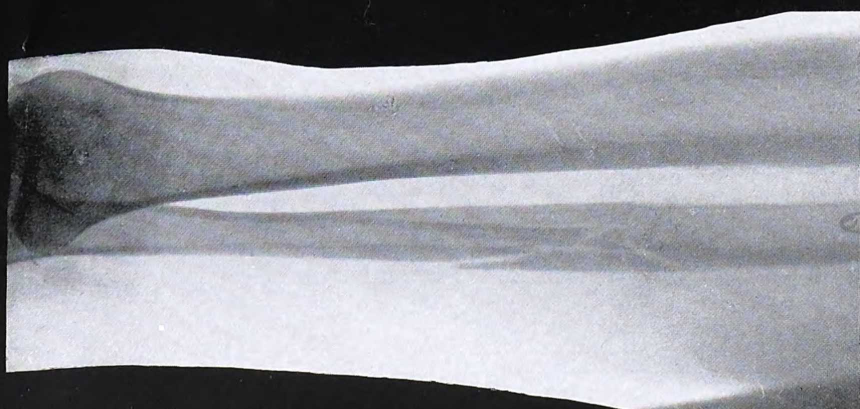

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FRACTURES, continued.

Fig. 118.—Tibia : Shaft : Greenstick.

There is no deformity of the leg.

A simple fissure is seen, and about a quarter of an inch below is one of greater intensity, which has permitted some displacement. Probably the periosteum was intact in the first case, and ruptured in the second.

Fig. 119.—Tibia and Fibula : Supramalleolar. (*See Fig.* 57.)

The whole foot has been wrenched inwards. There is a definite curve in the leg, with its convexity outwards.

The tibia has suffered an oblique fracture starting one inch above the tip of the malleolus, and ending at the tibio-fibular joint.

There is a greenstick fracture of the fibula two inches above the tip of the external malleolus.

Fig. 120.—Pott's Fracture. (*See Fig.* 24.)

Lateral view.

An oblique fracture of the fibula, with about a quarter of an inch of separation. The ankle is swollen.

Note the separate centres of ossification of the external tuberosity of the astragalus, representing the os intermedium of the embryologists. It must not be mistaken for a fracture. (I have found it present in quite half the number of ankles examined.—A.P.B.)

[*Brit. Jour. Surg.*, 1923, Jan.]

Fig. 121.—Pott's Fracture. (*See Fig.* 25.)

Antero-posterior view.

This happened as the result of a slip.

The astragalus has been driven against the external malleolus, fracturing the fibula at its weakest point. The tip of the internal malleolus has been dragged off. Sometimes the internal lateral ligament ruptures instead.

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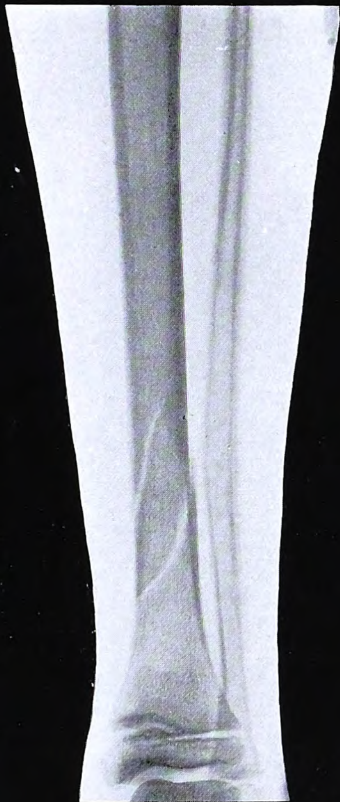

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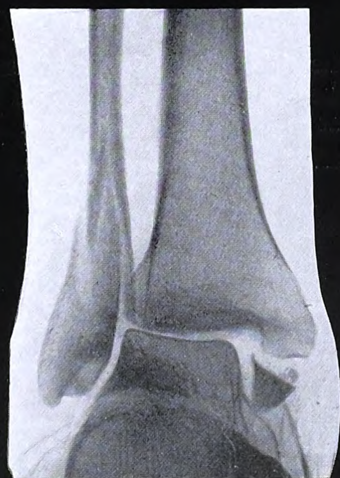


FRACTURES, continued.

Fig. 122.—Pott's Fracture. (*See Fig.* 25.)

Antero-posterior view.

The foot is wrenched outwards. The same factors were acting as in *Fig.* 121, but the damage was much greater. The tip of the internal malleolus has been torn off, and the fibula is comminuted about one and a half inches above the tip of the external malleolus. A rupture of the inferior tibio-fibular ligament has occurred, as evidenced by the space between the two bones.

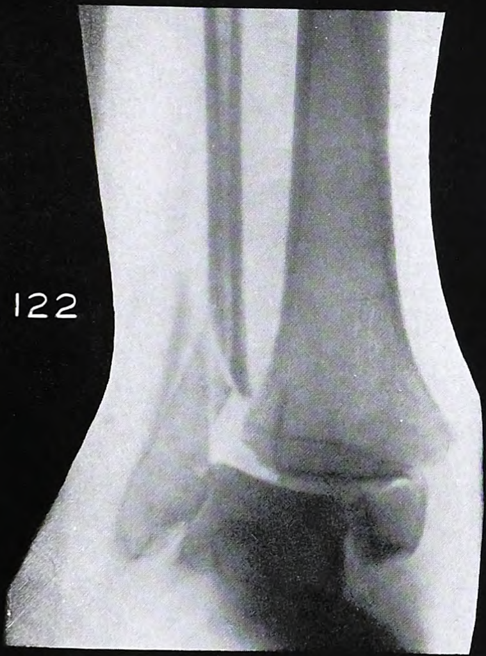
Fig. 123.—Pott's Fracture. (*See Fig.* 24.)

Lateral view. Same case as *Fig.* 122.

Fig. 124.—Os Calcis. (*See Fig.* 24.)

The patient, a house decorator, fell from a ladder on to his feet. The ankle became very swollen, and he was unable to put his foot to the ground on account of the pain. The os calcis is seen to be extensively crushed.

[*Mr. Knaggs.*]



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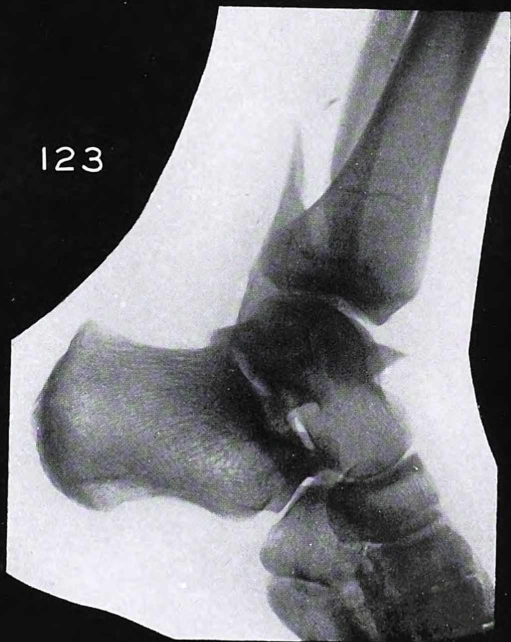

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FRACTURES, continued.

Fig. 125.—Metatarsals, Second and Third. (*See Fig.* 26.)

The second and third metatarsal bones are fractured transversely at their weakest point. The fracture was the result of a weight falling on the foot.

Note the stellate fracture of the internal sesamoid of the hallux.

Fig. 126.—External Sesamoid of Great Toe. (*See Fig.* 26.)

A transverse fracture of the external sesamoid of the great toe, with separation of the fragments.

It occasioned pain on walking.

Fig. 127.—Hallux: Proximal Phalanx. (*See Fig.* 26.)

A severe fracture of the first phalanx of the great toe, the result of a weight falling on it.

The toes show senile changes.

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FRACTURES, continued.

Figs. 128, 129.—Separation of Epiphyses.

Fig. 128.—Separated Lower Epiphysis of Humerus.

The patient, a boy of 12, fell on the point of the elbow, and as a result it became greatly swollen and discoloured, and blisters formed.

Observe the swelling and characteristic attitude, midway between flexion and extension.

The lower epiphysis of the humerus has been separated from the rest of the bone, and has torn with it a flake of the diaphysis. The condition is similar to that in *Fig.* 81. All the complications mentioned there are particularly prone to follow.

Fig. 129.—Separated Lower Epiphysis of Humerus: After Treatment.

A similar case to the above. Gas was administered, and, after a preliminary slight extension to disengage the surfaces, full flexion was made. This was maintained by a figure-of-eight strapping, and bandage. Note the position of flexion and the good alinement of the fragments obtained thereby.

Figs. 130–135.—Repair of Fractures.

Fig. 130.—Excessive Callus on Ulna. (*See Fig.* 18.)

A woman of 47 gave a history of a slight knock on the arm some six weeks before. She thought nothing more of it until a week later, when a lump appeared, and became painful. Examination revealed a hard, somewhat inflamed tumour over the ulna. A diagnosis of sarcoma—with spontaneous fracture—was provisionally made. Unable to come in at once, she returned three weeks later with the tumour about the same size. A diagnosis of callus was then made, which was confirmed by the microscope.

Note the prominence over the arm due to the bony mass. Across this is seen a fracture.

The large amount of callus is due to neglect of the fracture.

[*Lancet*, 1923, Oct. 6.]

Fig. 131.—Callus on Ulna.

Fracture of the ulna in a child about 12 years old. Callus is present in such a position that it will largely restore the alinement of the bone. The convexity of the angulation shows no formation of callus, and the angle will eventually become almost lost.

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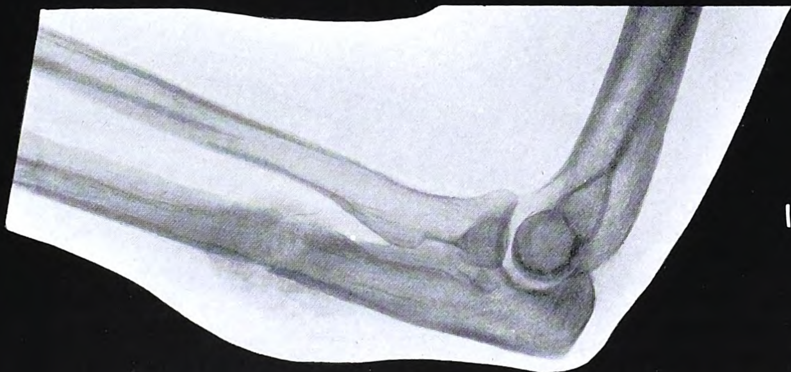

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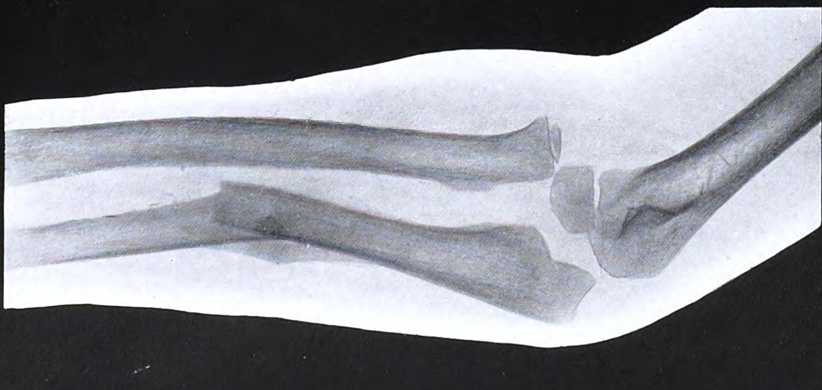

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FRACTURES, continued.

Figs. 132–135.—Repair of Fractures (*continued*).

Fig. 132.—Plating of Radius. (*See Fig.* 19.)

A plate has been introduced, and secured by a wire and two screws.

Note the complete absence of callus formation, and the diminished density of the bone in the neighbourhood of the plate, due to irritation by the latter. The absence of Nature's scaffolding—the callus—and the absorption of lime in the vicinity of the plate account for the many failures in this method of treatment.

Fig. 133.—Plating of Tibia.

The tibia has been successfully plated. The bone in the vicinity is dense, unlike *Fig.* 132.

The fibula had been broken in two places, in one of which union has taken place through the medium of ossified callus; in the other there is little sign of repair.

Fig. 134.—Band on Humerus.

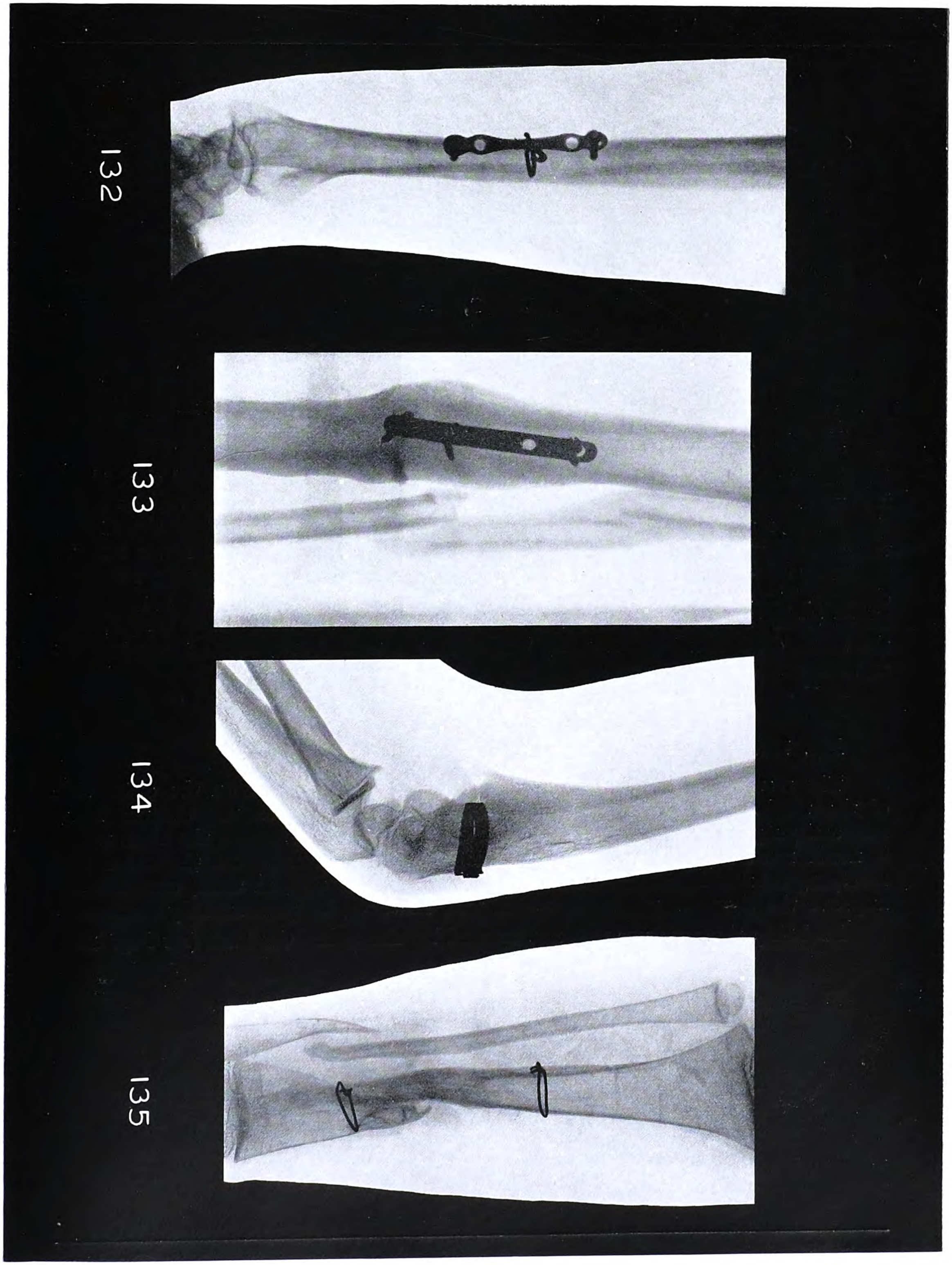
The patient had a separation of the epiphysis when 8 years old, and this band was introduced. Two years later movement was becoming less free, and painful. A sinus had appeared.

Note the band encircling the humerus. Above it has developed a spur of bone on both sides; the larger is suggestive of myositis ossificans.

Fig. 135.—Wiring of Tibia.

The two wires appear to have interfered with the nourishment of the bone between them, so that it has become rarefied and pointed.

Note the curious transverse striations in the bone (*see also Figs.* 149 and 235). It is suggested that they are rachitic in origin, and represent intermissions in the severity of the disease.



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FRACTURES, continued.

Figs. 136, 137.—FAULTY ALINEMENT AFTER FRACTURE.

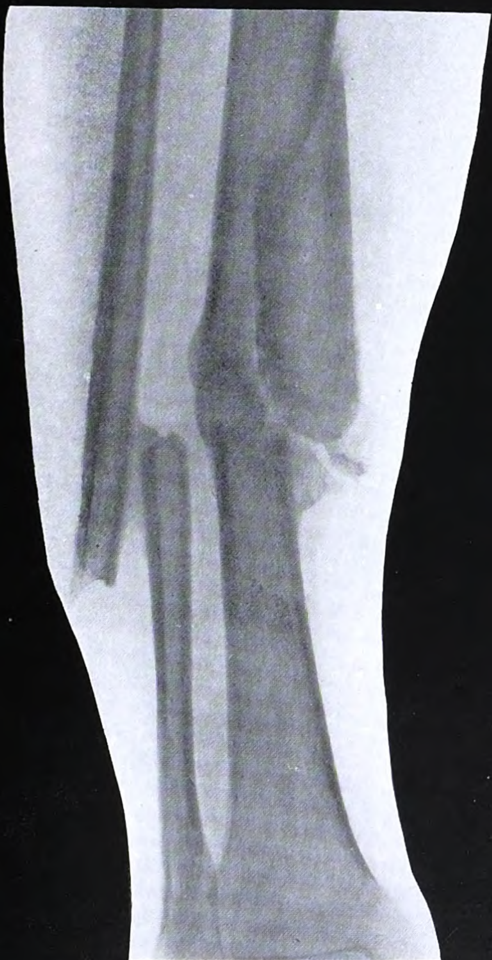
Fig. 136.—TIBIA AND FIBULA.

The fracture was caused by a severe crush. It will be observed that there is a prominence on the outer side of the leg, and some irregularity on the inner side. The former is due to the projection of the upper fragment of the fibula, which overlaps the lower by about two inches; callus joins the lower end to the inner side of the upper; the tip of the outer end is already showing atrophic changes. Two oblique fractures of the tibia have separated off a fragment about three inches in length. The main portions of the shaft have united, and the isolated fragment is becoming welded to the main bone, callus being present at both ends.

Fig. 137.—FEMUR: COMPOUND FRACTURE.

The result of a gunshot wound. Notice the prominence on the outer side of the thigh. Marked angulation of the fragments is present. On the inner side ossifying callus is developing in the endeavour to strengthen the bone where it needs most support, i.e., on the concavity of the bend. On the outer side rarefying osteitis is taking place. These two factors will, in time, considerably improve the shape of the bone, which will, however, be permanently shortened.

Probably this fracture was not treated by abducting the limb (*see Fig.* 106).



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FRACTURES, continued.

Figs. 138–141.—Complications of Fractures.

Fig. 138.—False Joint: Tibia and Fibula. (*See Fig.* 24.)

The patient, aged 57, had an osteotomy performed when young, presumably for rickets, the bones not uniting. Examination showed painless movement between the two fragments. Observe the projection of the foot backwards. There is marked posterior lipping of the opposed surfaces, and an absolute break in the continuity of the two bones. The direction of the articular surfaces of the ankle are altered, which predisposes to osteo-arthritic changes.

Fig. 139.—Vicious Union of Clavicle. (*See Fig.* 16.)

The clavicle has been broken, and apposition of the fragments has not been attained. The result is that the medullary cavity is not continuous, the bones being joined by a bridge of ossified callus and a comminuted piece of the clavicle.

Fig. 140.—Non-union of Radius.

The patient, a healthy man of 27, suffered a compound fracture of the radius and the ulna—the wound being on the radial side. Sepsis supervened, and the condition after six months is here shown.

Observe that there is no evidence of the formation of callus; the ends of the radius are hazy, and a triangular sequestrum is present.

Note the Carrel's tubes and the glass connector. Lead glass is very opaque to the rays, so that it can be readily demonstrated in the tissues.

Fig. 141.—Cross-union.

This shows a gunshot wound of the forearm which became septic.

The two segments of the radius have united through the medium of dense callus. The callus thrown out has involved the upper end of the ulna, which subsequently became united to the radius. The distal part of the ulna is atrophic, and the proximal end is pointed. There are present some pieces of necrosed bone.

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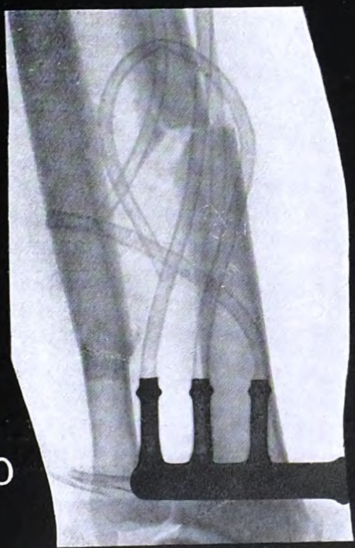

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FRACTURES, continued.

Figs. 142–145.—Complications of Amputation Stumps.

Fig. 142.—Atrophy of Bone. (*See Fig.* 16.)

The arm has been amputated in its upper third. The muscular covering is good.

The shaft is very thin, whilst the head is normal, save for some absorption of lime salts. The cause of the atrophy may be disuse; sometimes this is so extreme as to render the bone of a stump liable to fracture from slight cause. Whether the alteration in the blood-supply following operation has any bearing is doubtful.

Fig. 143.—Necrosis. (*See Fig.* 55.)

The patient was about 15 years of age. Amputation of the leg had been performed at the site of election.

The femur, patella, and tibia are all rarefied. The sawn end of the tibia is extremely indefinite, the bone passing imperceptibly into the flesh; a round sequestrum is present behind.

Fig. 144.—Spur.

The covering of the stump is inadequate, and from both sides, but particularly the left, project spurs of bone. The external end of the bone is undergoing rarefying osteitis.

Some surgeons advocate stitching the periosteum over the cut ends to prevent these spurs arising, but the cause is probably sepsis. They occasion great pain.

Fig. 145.—Atrophy of Covering. (*See Fig.* 52.)

The patient, a lad of 14, had a smash six months before, and amputation in the middle of the arm was necessary. Everything went well for four-and-a-half months, when he knocked the stump. Resulting from this there was a copious purulent discharge with agonizing pain. Note the conical stump, with the end of the bone protruding through the skin. It is rarefied, and proximal to the rarefaction is some sclerosis.

Re-amputation was done. The bone was found to be very friable. The main nerves of the arm were involved in fibrous tissue, and each terminated in a bulbous extremity.

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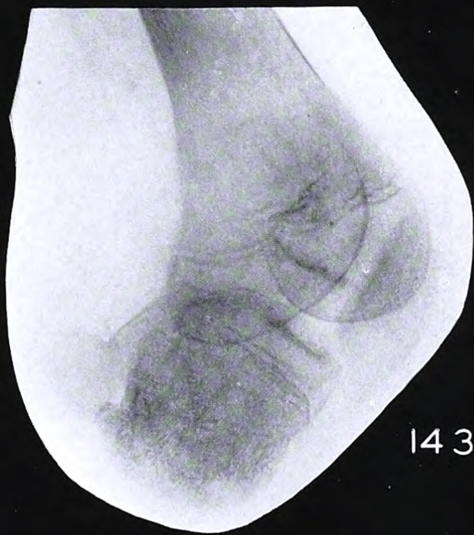

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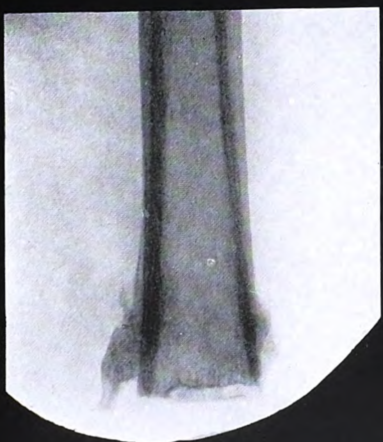

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PART IV.

DISEASES OF BONES

DISEASES OF BONES.

Figs. 146-149.—Atrophy of Bone.

Fig. 146.—Atrophy of Tarsus. (*See Fig.* 24.)

The tarsal bones appear as ghosts of normal bones, their dark margins contrasting strangely with their centres.

Fig. 147.—Atrophy of Finger. (*See Fig.* 4.)

The terminal phalanx of the middle finger is pointed and atrophic; on the other fingers are nodular deposits of lime salts, possibly gouty in origin. Osteo-arthritic changes are present in the first interphalangeal joints of the second and third fingers.

Fig. 148.—Atrophy of Foot (Charcot's). (*See Fig.* 26.)

The patient had several chronic ulcers of the foot. The Wassermann reaction was positive. Many of the phalanges, and the second and third metatarsals, are dwarfed and atrophic.

Fig. 149.—Atrophy of Tibia and Fibula. (*See Fig.* 47.)

A fracture of both bones, which occurred some time previously, failed to unite. The tibia was wired not long before the skiagram was taken, but an angular deformity, well shown in the silhouette, resulted or recurred. Only slight traces of callus can be seen. The segment of the tibia distal from the nutrient foramen is very much rarefied, and pointed; transverse markings, already alluded to as suggestive of rickets, are visible (*see Figs.* 135 and 235).

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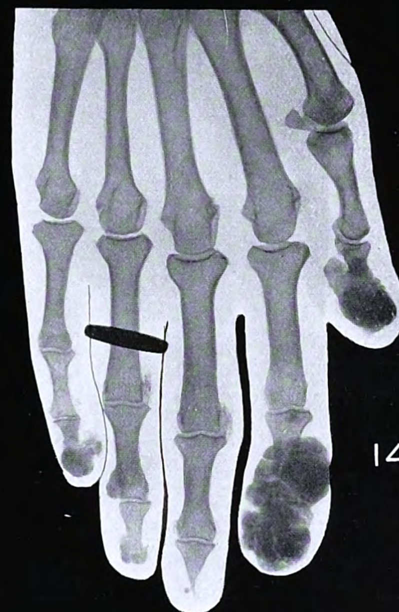

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DISEASES OF BONES, continued.

Figs. 150-153.—Myositis Ossificans.

Fig. 150.—Myositis Ossificans in Brachialis Anticus. (*See Fig.* 43.)

There has been a fracture-separation of the lower epiphysis of the humerus. Reduction of the fragments has not been accomplished, and the epiphysis has united to the back of the diaphysis, leaving a sharp lower end projecting among the fibres of the brachialis anticus. In this muscle myositis ossificans has developed. Here and in the adductor magnus are probably found the commonest sites for its development.

Fig. 151.—Myositis Ossificans in Rectus Abdominis.

This plaque of bone was removed at operation from the rectus abdominis. There had been a previous operation through the rectus in the subcostal angle, the scar of which was causing pain and discomfort.

[*Mr. Richardson.*]

Fig. 152.—Myositis Ossificans: Ossification in Ligamentum Patellæ. (*See Fig.* 22.)

A large osseous mass is present in the ligament.

[*Mr. Braithwaite.*]

Fig. 153.—Myositis Ossificans of Vastus Internus.

This developed in the vastus internus as the result of a blow. It is analogous to the 'rider's bone' which is the expression of multiple traumata. The pain it caused necessitated removal, which was successfully done. Observe that the bone is laid down in the direction of the muscle fibres.

[*Mr. Richardson.*]

Fig. 154.—Calcification of Arteries. (*See Fig.* 24.)

Observe the anterior and posterior tibial and peroneal arteries with an irregular deposit of lime salts in their walls. Sometimes true bone appears in this deposit.

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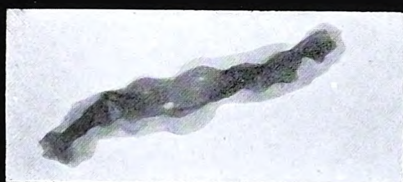

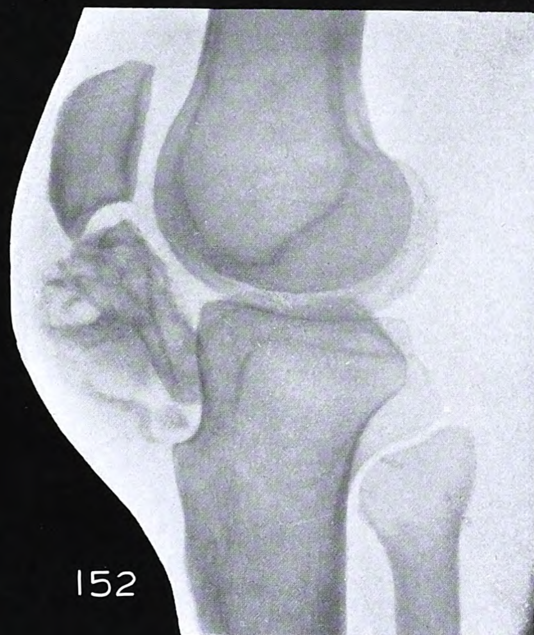

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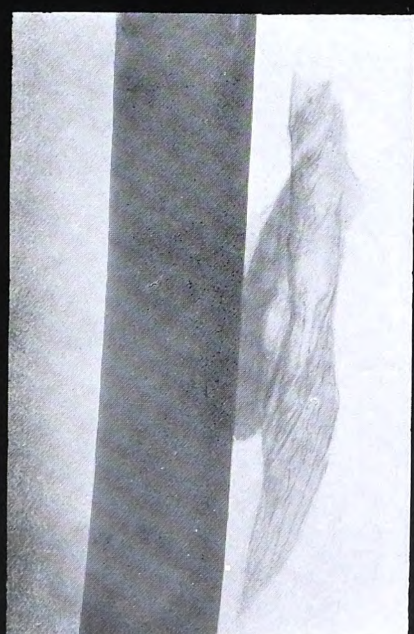

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DISEASES OF BONES, continued.

Figs. 155–160.—Dactylitis.

Fig. 155.—Syphilitic Dactylitis. (*See Fig.* 4.)

The shaft of the fourth metacarpal is thickened by periosteal deposit.

Fig. 156.—Periosteal Whitlow. (*See Fig.* 4.)

A man of 60 complained of agonizing pain in, and chronic discharge from, the thumb. Note the typical bulbous end of the phalanx. The tip of the terminal phalanx has become a sequestrum, and smaller ones are scattered throughout.

[*Lancet,* Oct. 6, 1923.]

Fig. 157.—Tuberculous Dactylitis. (*See Fig.* 42.)

The patient, age 15, had a discharging sinus on the third finger. There was no pain, and no history of injury.

The shape of the finger, thick at the root, and tapering to the tip, its diameter there being equal to that of the little finger, is very characteristic. The density and defined edge of the remains of the shaft suggest that, although a sequestrum is present, the disease is tending to recovery. Compare the density of the epiphysis with the corresponding one of the little finger.

[*Mr. Thompson.*]

Fig. 158.—Syphilitic Dactylitis. (*See Fig.* 32.)

The child, age 2, had a history of 'snuffles,' but was otherwise healthy until a swelling appeared on the dorsum of the hand. This developed into an abscess. Whilst in hospital the child's right knee, right leg, and finally gums, successively became swollen, and then resolved.

Mark the great increase in girth of the second and fifth metacarpal bones, due to subperiosteal new bone formation, within which the original bone is seen.

[*Mr. Dobson.*]

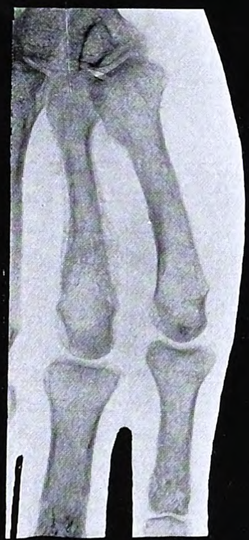
Fig. 159.—Pyogenic Dactylitis. (*See Fig.* 4.)

A compound fracture of the little finger was sustained, and sepsis supervened. The shape of the finger resembles that of a thumb. There had been a fracture through the middle of the bone; in its vicinity the bone is hazy, and probably necrotic, whilst the density of the shadow on either side, and its definite margins, point to the line of demarcation.

Fig. 160.—Tuberculous Abscess of Metacarpal. (*See Fig.* 34.)

A large abscess, surrounded by a ring of sclerosed bone, is seen in the third metacarpal. Within the abscess the original bone is undergoing absorption.

[*Mr. Braithwaite.*]



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DISEASES OF BONES, continued.

Fig. 161.—NECROSIS OF METACARPAL. (*See Fig.* 4.)

A chronic discharging sinus was caused by an injury from a circular saw.
The second metacarpal is much denser than normal, the result of chronic osteomyelitis due to the inflammatory reaction in the head. This has caused a sequestrum, shown in the skiagram.

Fig. 162.—MYELOMA OF PHALANX. (*See Fig.* 4.)

In the middle of the second phalanx is a radiolucent tumour with trabeculæ projecting from the sides. It may be readily confused with an enchondroma (*see Fig.* 206).

Fig. 163.—OS VESALII. (*See Fig.* 26.)

A separate centre of ossification is often present in the projecting base of the fifth metatarsal, and must not be interpreted as a fracture.

Fig. 164.—CONGENITAL SYPHILIS OF HUMERUS AND ULNA. (*See Fig.* 43.)

The humerus and the ulna are the sites of fusiform swellings consisting of lamellæ of bone arranged parallel to the surface; in the humerus these are particularly clear.

Fig. 165.—OSTEOMA OF METACARPAL. (*See Fig.* 4.)

A large round mass of almost normal bone is manifest projecting from the fifth metacarpal, which is much thickened.

Fig. 166.—TUBERCULOSIS OF LITTLE TOE. (*See Fig.* 48.)

A rarefied area on the diaphyseal side of the epiphysis suggests a tuberculous focus, which has led to sequestrum formation. It has destroyed the centre of the bone, and set up a chronic plastic periostitis.
There was swelling, and pain on walking.

[*Mr. Coupland.*]

Fig. 167.—PERIOSTITIS OF METATARSAL. (*See Fig.* 48.)

Masses of irregular bone of new formation are seen at the proximal and distal ends of the third metatarsal. No notes.


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DISEASES OF BONES, continued.

Fig. 168.—Gummatous Periostitis of Humerus. (*See Fig.* 17.)

There is an osteomyelitis by extension. (N.B.—Two round areas present are artefacts on the negative.)

[*Dr. Bibby.*]

Fig. 169.—Tertiary Syphilitic Periostitis. (*See Fig.* 18.)

The humerus, ulna, and radius are affected by gummatous deposits.

Dislocation of the radius has occurred, no doubt from softening or destruction of the orbicular ligament. The head has shared in the general deformation, and shows the influence of the pressure of the ligament outside the articular surface.

Fig. 170.—Congenital Syphilis of Ulna. (*See Fig.* 43.)

Fusiform swellings were present on the ulnæ, femora, and tibiæ of a girl, age 11. Other signs of syphilis were present, and the Wassermann reaction was positive. A fullness is apparent over the site of the disease.

Longitudinal lamellæ are visible, and between them bone is laid down at right angles to the shaft.

[*Dr. Telling.*]

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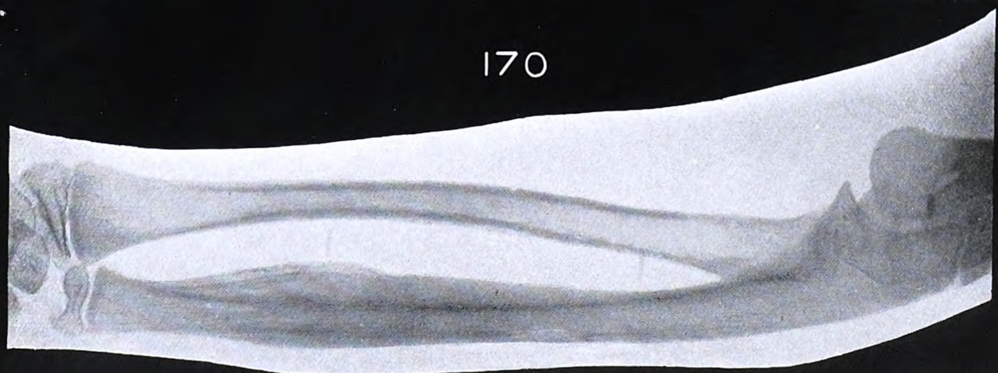

DISEASES OF BONES, continued.

Fig. 171.—Chronic Osteomyelitis of Femur. (*See Fig.* 54.)

The result of acute osteomyelitis of the lower end of the femur of a boy, age 8.

There is great thickening of the shaft, due to deposition of periosteal bone. Within the limits of the original compact bone there is a rarefied area tapering towards its upper extremity, and sharply bounded above by a deeper shadow. The periosteal deposit ceases a little above this rarefied area. The latter makes a cavity in which lies an elongated central sequestrum. A discharging sinus was present.

[*Mr. Daw.*]

Fig. 172.—Acute Osteomyelitis of Fibula, with Necrosis. (*See Fig.* 57.)

The sequestrum (*a*), which in its lower part includes the whole circumference of the bone, is quite, or almost entirely, separated. The involucrum appears to be incomplete.

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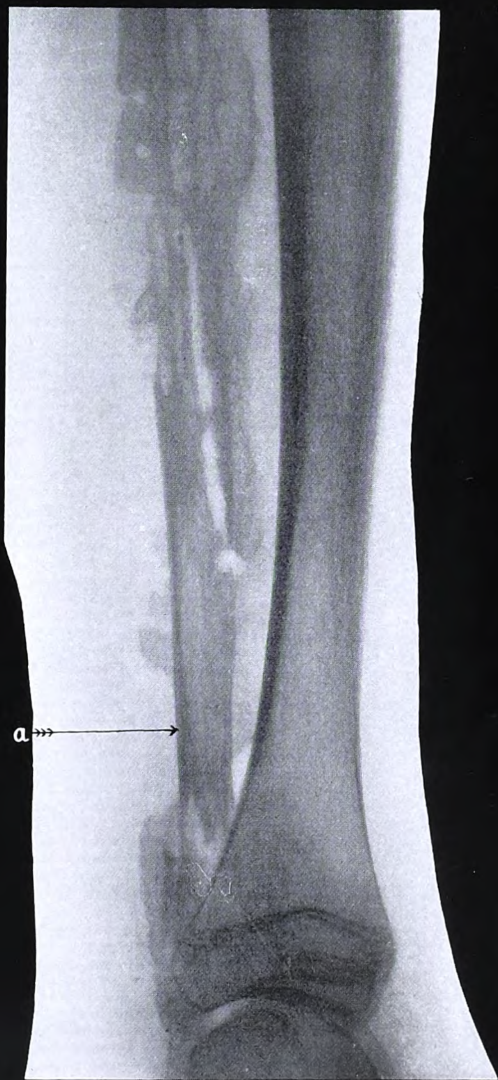

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DISEASES OF BONES, continued.

Fig. 173.—Acute Osteomyelitis of Tibia. (*See Fig.* 38.)

This is a difficult skiagram to interpret. There is a very thick involucrum, which extends over the whole diaphysis. There are several pale areas with central narrow, dark shadows. These suggest suppurating cavities enclosing small sequestra, which from their shape, and in some cases from their position, are clearly portions of the compact tissue. Had a large portion of the shaft of the tibia necrosed there would evidently have been time enough for a definite line of separation to show itself.

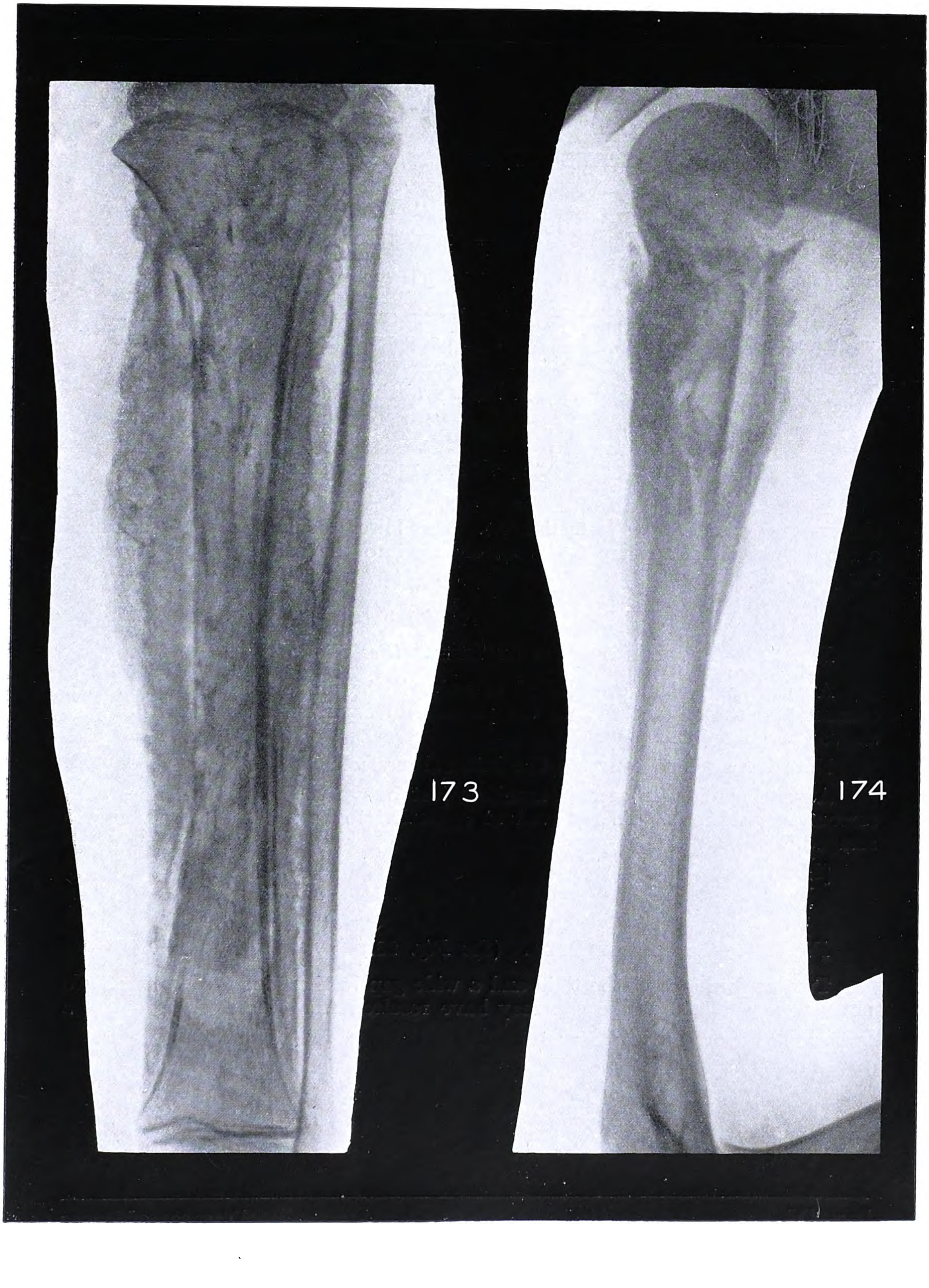
[*Mr. Thompson.*]

Fig. 174.—Acute Osteomyelitis of Humerus. (*See Fig.* 41.)

A boy, age 10. The upper part of the shaft of the humerus is necrotic, and is surrounded by a mass of dense new bone. The cancellous structure of the bone, which is apparent below, is absent above, where the bone is dead. This will eventually loosen and form a sequestrum. A small sequestrum is seen to have made its way from a cloaca visible on the outer side of the bone.

The humerus was attacked three weeks after an operation for acute osteomyelitis of the femur. The arm became swollen and movement painful. Pus was found under the periosteum.

[*Mr. Richardson.*]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DISEASES OF BONES, continued.

Figs. 175–178.—Bone Abscess.

Fig. 175.—Abscess of Radius. (*See Fig.* 20.)

A piece of shrapnel is seen in the lower end of the radius, which shows evidence of fracture. Round the foreign body an abscess has formed, and the bone surrounding this is condensed.

The bones show a deficiency in lime, probably due to disuse.

Fig. 176.—Abscess of Radius, Tuberculous. (*See Fig.* 53.)

The lower fifth of the shaft is considerably thickened, and contains a localized abscess surrounded by sclerosed bone. The lower loculus probably contains a sequestrum, and appears to be advancing into the epiphysis, and towards the joint.

Fig. 177.—Brodie's Abscess of Tibia. (*See Fig.* 57.)

A girl, age 7, had complained of pain in the ankle for some days. An examination showed the foot in the position of equinus, swollen and hot just above the ankle-joint.

Note the swelling over the the internal malleolus.

A rarefied circular area is manifest just above the epiphyseal line, with surrounding sclerosis. This proved at operation to be an abscess, which was scraped.

[*Mr. Dobson.*]

Fig. 178.—Abscess of Tibia. (*See Fig.* 23.)

Two perforations of the tibia and a wide gap in the bone are present. No notes were available. The gap may have resulted from the scraping out of a myeloma or a Brodie's abscess.

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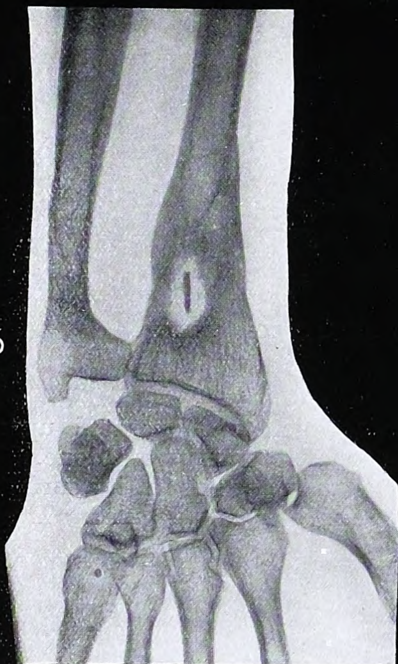

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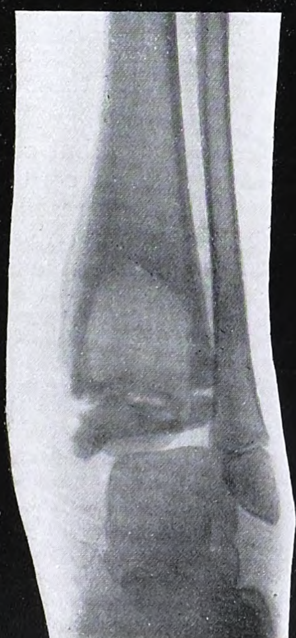

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DISEASES OF BONES, continued.

Figs. 179, 180.—Some End-results of Osteomyelitis.

Fig. 179.—In the Tibia. (*See Fig.* 38.)

A child, age 5, had an acute osteomyelitis which was operated upon. Several subsequent operations of the nature of sequestrotomies were done.

The tibia has stalactite-like processes of bone projecting from its surface. The disease is at a standstill, as the margins of the bone are regular. These processes will undergo disuse-atrophy ultimately.

Fig. 180.—In the Ulna. (*See Figs.* 17 and 20.)

This was the condition present in a woman of 58, who had to be operated upon 45 years previously for " inflammation of the arm ". The arm had been functionally very useful, and she came now in consequence of a fall.

The arm was considerably foreshortened, and bent in a direction opposite to the deformity of a congenital absence of the radius (*see Fig.* 283). This bending is due mainly to unbalanced action of muscles, but in some degree also to the tissues on the unsupported side being unable to keep pace with those on the supported side.

The ulna is seen to articulate with the radius and humerus above, but only three inches of it remain. Beyond this it is represented by a thin cord of connective tissue impregnated with lime salts, until its lower end is reached. This is extremely rarefied, but articulates normally. The radius is very dense, to compensate for the loss of the ulna, and is curved with its convexity outwards.

The case shows the effect of premature removal of the dead portions of bone before the subperiosteal layer has been stimulated to form osteoblasts.

179

180

DISEASES OF BONES, continued.

Fig. 181.—CHRONIC OSTEOMYELITIS AND PERIOSTITIS OF HUMERUS. (*See Fig.* 16.)

A woman of 47 complained of excruciating pain and stiffness of the shoulder during the previous few months. Examination was difficult owing to the pain; little movement was obtained. Note the wasting of the deltoid muscle.

At its upper part the bone is thicker than normal, and presents a well-marked internal ridge; it is less dense than usual. The lower part of the bone is thin and atrophic. Two rarefied areas are present in the surgical neck, the inner one possibly containing a sequestrum. There is considerable periostitis. The glenoid fossa is lacking in distinctness, and the adjoining part of the scapula has lost its texture, possibly from ankylosis. The head of the humerus and tips of the acromion and clavicle are deficient in calcium.

The cause may have been tuberculosis, or more likely a Brodie's abscess.

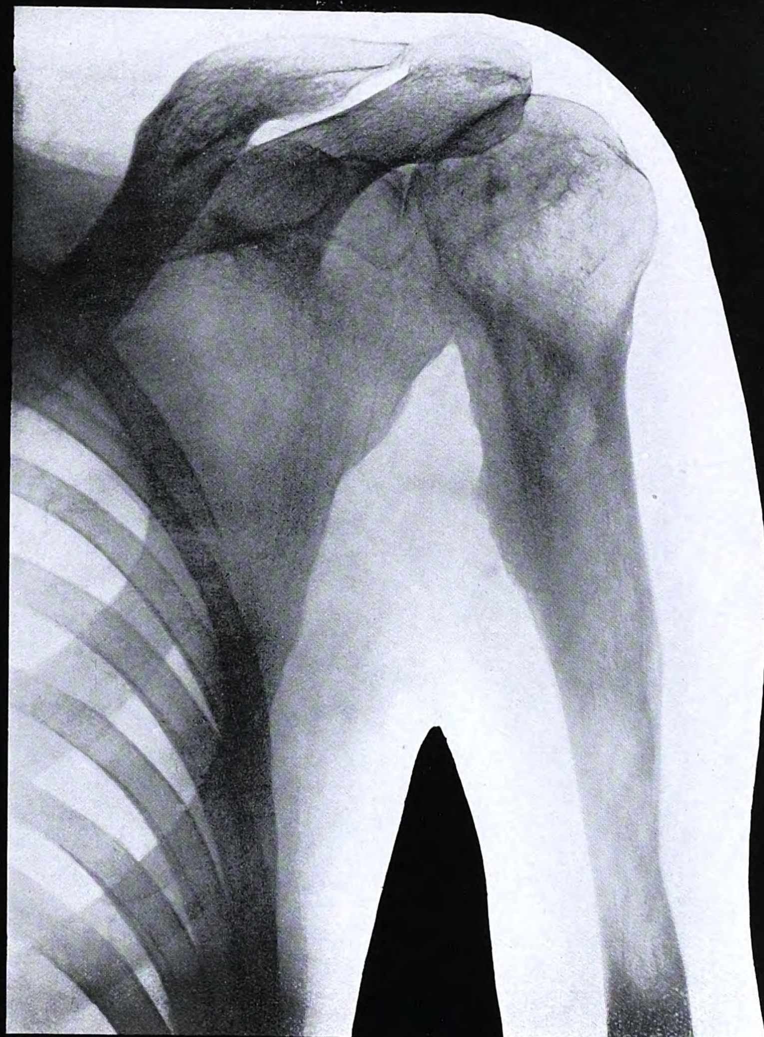
[*Mr. Dobson.*]

Fig. 182.—TUBERCULOUS RADIUS. (*See Figs.* 51 and 53.)

The patient, age 14, had multiple typical sinuses in the forearm, which were adherent to the bone, and discharged freely a thin yellowish pus. The scrapings were the typical grey granulations of tubercle.

The outer border of the radius is irregular. The inner presents a cloaca above, and an irregular area of erosion below. In this bay is a long sequestrum at right angles to the surface; another sequestrum is present between the radius and ulna.

[*Mr. Braithwaite.*]



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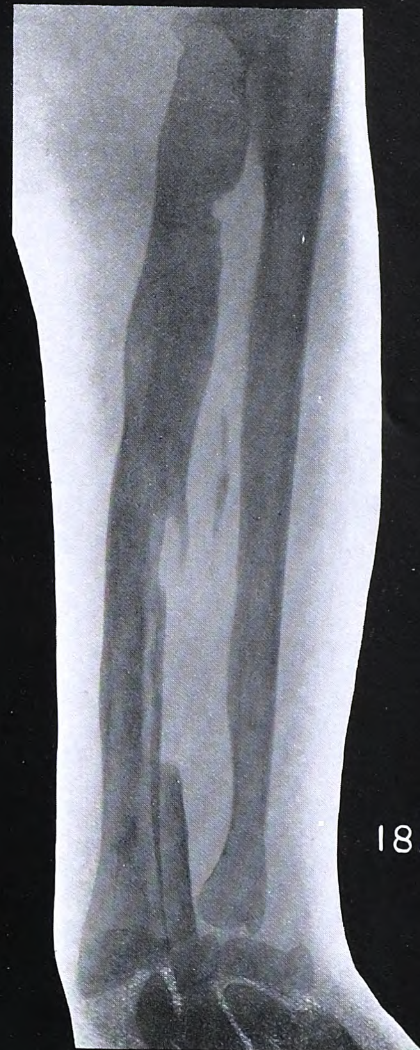

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DISEASES OF BONES, continued.

Fig. 183.—Syphilitic Periostitis of Tibia.

Observe the mass of new bone laid down in a fusiform manner along the shaft of the tibia. It is fully a third of an inch in thickness at its middle, but fades away above and below. It is of lighter density than normal bone.

[*Dr. Watson.*]

Fig. 184.—Syphilitic Periostitis of Ulna. (*See Fig.* 17.)

The whole bone, save its lower extremity, is greatly increased in density. Scattered throughout are areas of comparative transparency, giving it a mottled appearance. The humerus also is slightly affected.

Fig. 185.—Syphilitic Periostitis of Tibia. (*See Fig.* 55.)

The patient, a boy of 19, came up on account of an ulcer over the tibia. The ulcer was adherent to the bone, and was thought to be tuberculous, but it promptly disappeared under antisyphilitic treatment.

The depression on the surface of the new periosteal deposit suggests that the periostitis was secondary to the ulcer. Notice the swelling over the diseased bone.

[*Dr. Veale.*]

Fig. 186.—Typhoid Abscess of Tibia. (*See Fig.* 55.)

The patient, a girl, age 17, had a severe attack of typhoid fever four years before. During convalescence she began to have " boring pains " in the tibia, and swelling and redness over it, with periodic exacerbations. Examination revealed a hot fluctuating swelling over the tibia.

Note the prominence over the tibia due to an underlying mass of bone. The centre of this shows rarefaction due to an abscess; note also the typical sclerosis of bone round it.

[*Mr. Coupland.*]

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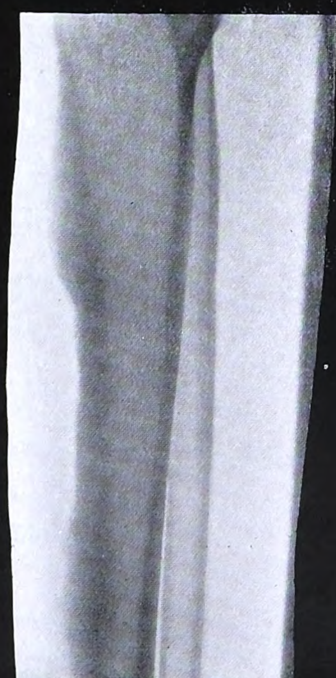

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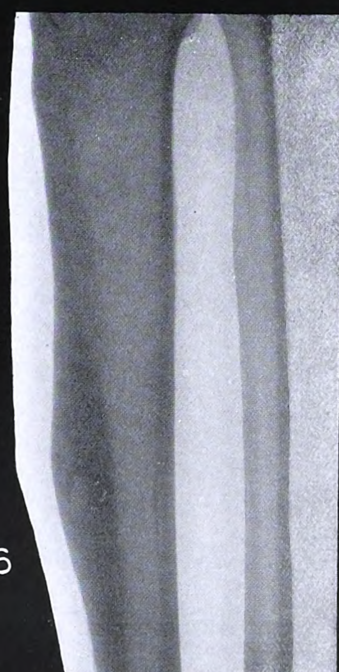

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DISEASES OF BONES, continued.

Figs. 187–190.—Rickets.

Fig. 187.—Rickets of both Femora. (*See Figs.* 49 *and* 54.)

Note the position, the gap between the thighs, and one leg actually crossing the other. The shafts of the femora are dense, but those of the tibia are less so. The epiphyses at the knee are enormously expanded, and are somewhat radiolucent. There is a healing fracture of the left femur, and a more recent one of the right, both situated at about the position of greatest curvature.

The patient was 13 years old, very stunted in stature, and had not walked for several years. No deformities of the spine or arms were present.

There was some doubt as to the exact pathology, owing to the severity of the case.

[*Mr. Daw.*]

187

DISEASES OF BONES, continued.

Figs. 188–190.—Rickets (*continued.*)

Fig. 188.—Rickets : Cured. (*See Fig.* 38.)

A straightforward case of rachitic genu valgum. Note the crossing of the two legs at the knee, and the separation of the two thighs.

The femora show characteristic rarefaction above the epiphyseal line, where the deformity has occurred. The internal condyle appears elongated, due to the depth of the epiphysis.

The disease is cured, as evidenced by the sharply defined epiphyseal lines. At the attachment of the internal lateral ligament to the right tibia is a spur.

[*Mr. Daw.*]

Fig. 189.—Rickets of Tibia. (*See Fig.* 39.)

The leg shows the well-known anterior curve of rickets, due to bending of the bone, and not to new bone formation as in syphilis. Above the epiphysis the bone is rarefied as in *Fig.* 188. The regular epiphyseal lines point to the condition being quiescent.

[*Dr. Vining.*]

Fig. 190.—Rickets of Radius and Ulna. (*See Fig.* 34.)

The forearm and hand of a child, age 2½, the subject of active rickets. The epiphyseal lines are greatly expanded and hazy, their usual sharp outlines having disappeared.

To avoid a mistaken diagnosis of tuberculosis in such a condition is often difficult.

[*Dr. Vining.*]

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DISEASES OF BONES, continued.

Fig. 191.—Hallux Valgus. (*See Fig.* 26.)

Notice the prominence on the inner border of the foot on which the bursa, commonly known as a bunion, develops. The great toe is directed outwards, thus crossing the second toe. There is no sign of arthritis or bone disease. The external sesamoid is displaced outwards.

[*Brit. Jour. Surg.*, Jan., 1923.]

Fig. 192.—Pes Cavus. (*See Fig.* 26.)

The foot shows a concavity on its inner side. The metacarpus is arched up, shortening the whole foot; the sesamoid bones are displaced inwards.

Fig. 193.—Pes Planus. (*See Fig.* 24.)

The arch of the foot is entirely gone. The os calcis is lying horizontally, its tubercle resting on the sole, probably causing pain. Sometimes a well-marked spur occurs in this situation, necessitating removal.

Fig. 194.—Traumatic Separation of the Tibial Epiphysis: Schlatter's Disease. (*See Fig.* 55.)

Occurred in a girl, age 14, as the result of a wrench. The tubercle of the tibia became painful on extending the limb, or on being touched. The case was successfully treated with a back splint.

The part of the epiphysis forming the tibial tubercle is torn upwards, thus accounting for the pain on extension.

[*Mr. Dobson.*]

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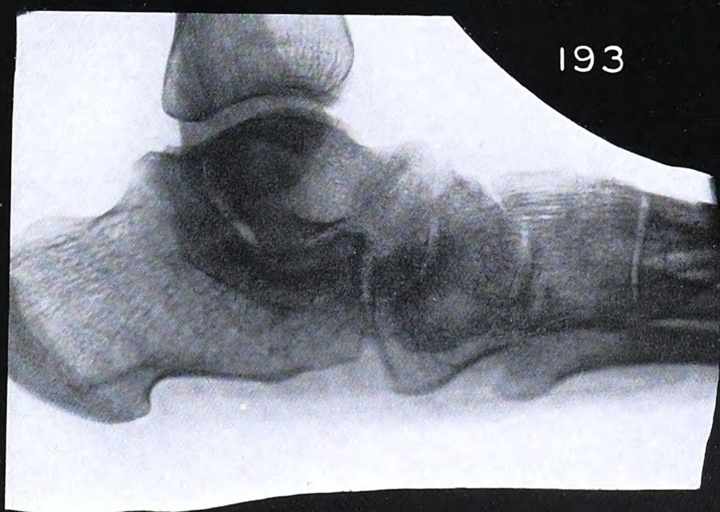

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DISEASES OF BONES, continued.

Fig. 195.—Fragilitas Ossium. (*See Fig.* 49.)

This femur was broken nine times, but radiographically the bone appears almost normal. A fracture just below the lesser trochanter is visible.

Fig. 196.—Cyst of Femur. (*See Fig.* 55.)

The patient, a girl of 19, suffered a spontaneous fracture of the femur. Screen examination showed the presence of a large cyst expanding the lower quarter of the bone to a mere shell. The cyst was resected, with a portion of the femur above and below, and subsequent bone-grafting was completely successful.

[*Mr. Dobson.*]

Fig. 197.—Cyst of Neck of Femur. (*See Fig.* 45.)

A boy of 7 complained first of pain in the hip; flexion was limited to 90°, the other movements being normal. A hip splint was ordered. On examination four months later a cyst was apparent under the rays. There was no muscular wasting. A sharply limited cavity is present in the neck of the femur, with somewhat dense walls, but not nearly so dense as those of an abscess (*see Fig.* 177).

At operation, a thin-walled shell was broken into, exposing a cavity lined with granulation tissue. This was scraped and 'bipped'.

The history and appearance strongly suggest tubercle, but the microscope confirmed the diagnosis of cyst.

[*Mr. Daw.*]

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DISEASES OF BONES, continued.

Fig. 198.—Osteitis Deformans of Tibia.

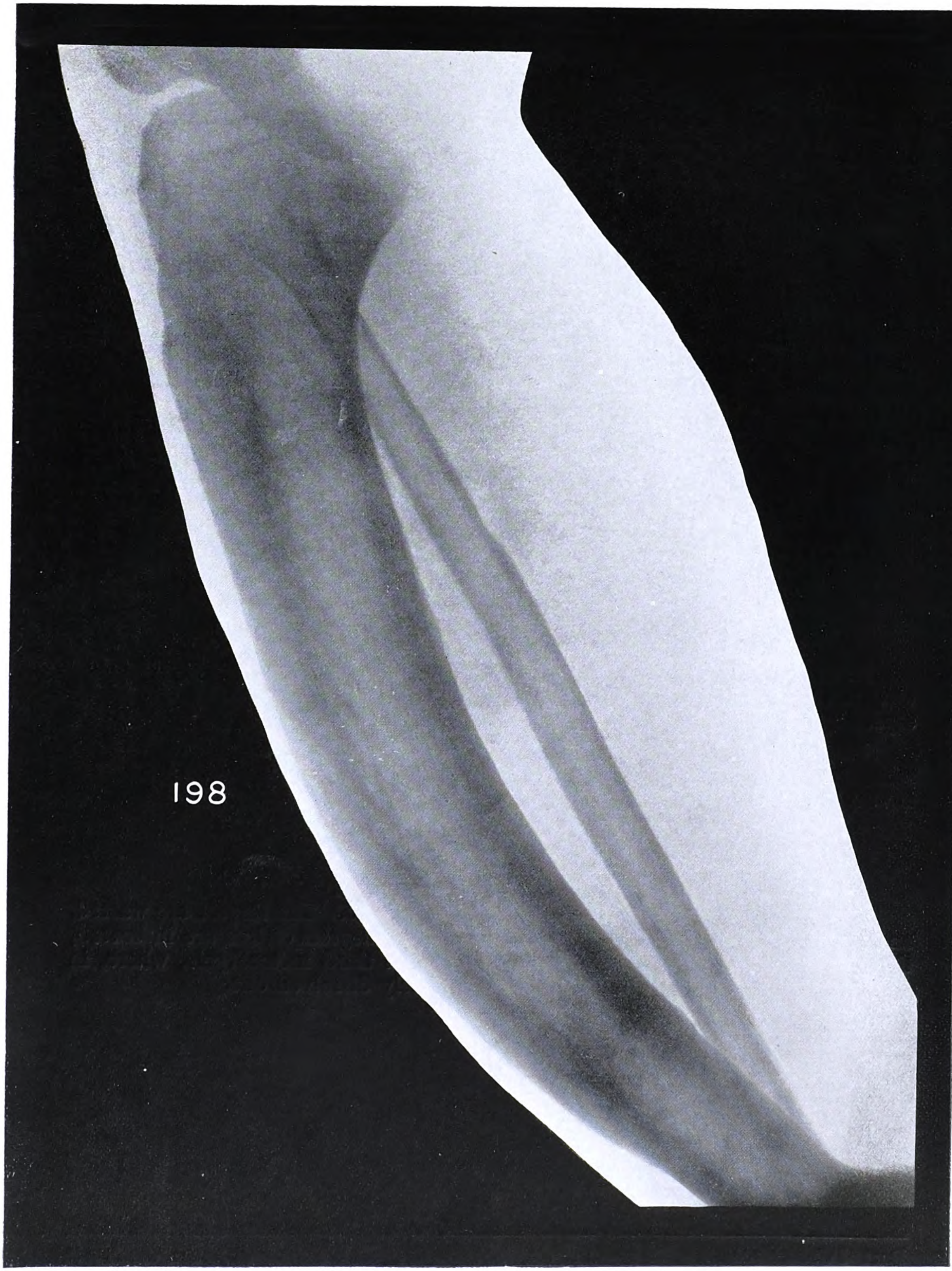
The patient, aged 58, fractured his tibia whilst playing football twenty years ago, since which time his leg has been gradually bending forwards. He had no symptoms, save a sense of weakness in the limb when tired, until the last three months, when he has had severe pain, especially at night. No other bone is affected. The family history is good, and the Wassermann reaction negative.

Note the characteristic long anterior curve of the leg.

The fibula is normal, and the bending of the tibia enables it to maintain its articulations with that bone. This is easily effected, as the bone, although dense to the rays, is very soft and malleable.

Observe the slight difference in density between the compact bone and the medulla, and the great increase in thickness of the former. Contrast this with syphilitic periostitis (*Fig.* 183) and rachitic curves (*Fig.* 189).

[*Mr. Coupland.*]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DISEASES OF BONES, continued.

Fig. 199.—Osteitis Deformans of Ulna. (*See Fig.* 18.)

The patient, age 45, came up on account of the bending forwards of his legs. Examination showed the tibiæ to be bent, with an anterior convexity and rounded anterior borders. Both ulnæ also were bent, with a convexity inwards. The head was large, but there was no history of his taking larger sizes in hats. The marked increase in the circumference of the bone is due to new bone formation of slighter density than normal. Several areas of comparative rarefaction are evident; these are very typical of the condition. The ulna has bent to retain its articulation with the radius.

[*Mr. Coupland.*]

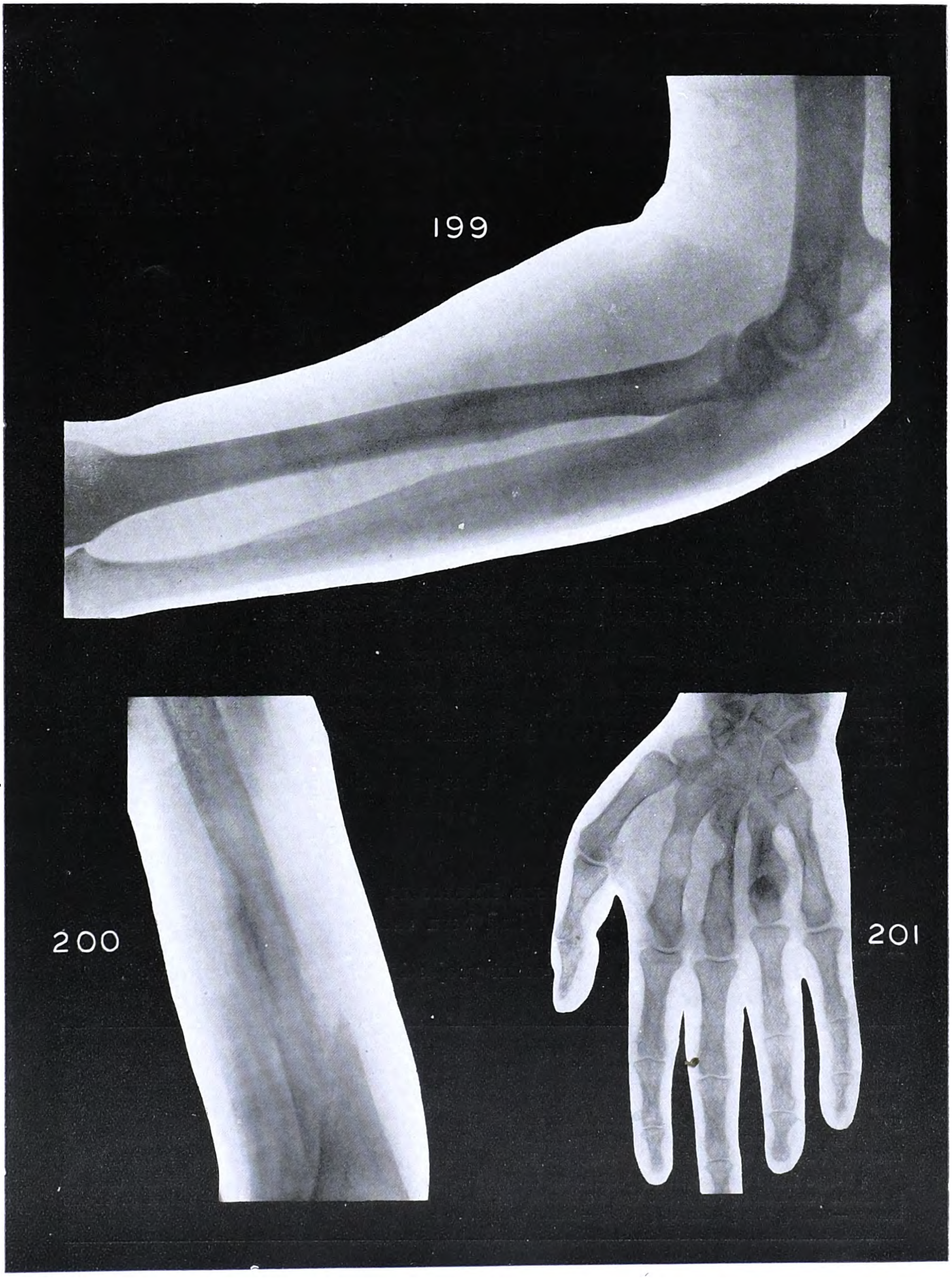
Fig. 200.—Osteomalacia of Femur. (*See Fig.* 23.)

In this case Dr. Rowden stated that at first he could not realize that a woman was on the couch, so transparent were the bones. The X-ray tube had to be especially modified before a picture could be obtained.

The thigh is much wasted. The femur is seen to be almost devoid of lime salts, its density being only slightly greater than that of the muscles. A fracture is visible, and there is no sign of repair.

Fig. 201.—Osteomalacia of Hand. (*See Fig.* 4.)

A hand of the same patient as shown in *Fig.* 200. The fingers are wasted, and the bones shown great lack of calcium. The degrees of loss are indicated, the greatest being in the case of the second and third metacarpals, where, in certain areas, the lime salts have been completely dissolved out.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DISEASES OF BONES, continued.

Fig. 202.—Exostoses round the Knee. (*See Fig.* 54.)

A miner of 17 complained of 'lumps' about the knee. He had a severe sprain of the knee in the pit two years before. No splint was worn, but he was confined to the house for several weeks. Since his accident he has become somewhat 'knock-kneed'.

Examination confirmed a degree of genu valgum of the right leg. At both extremities of the internal lateral ligament were large bosses of bone projecting away from the joint*. Another boss was present below the styloid process of the fibula, and smaller ones on the left knee. There was a round bony nodule lying quite superficially in the popliteal area.

Large prominences are visible above and below the joint. They are caused by underlying masses of bone of slight density and devoid of the normal 'grain'; a mass is present on the outer side of the tibia also. A small stalactite of bone projects downwards from the fibula. The nodule felt behind the joint is apparent as a bilocular shadow behind the external condyle. The patella has been displaced inwards.

[*Mr. Braithwaite.*]

Fig. 203.—Exostosis of Scapula. (*See Fig.* 27.)

An exostosis is present near the vertebral border of the scapula, about the level of the spine, no doubt growing from the epiphyseal line.

Fig. 204.—Subungual Exostosis. (*See Fig.* 24.)

Occurred in a woman of 23, and had been growing for eight years. The inner half of the nail was absent, and through the defect projected a white 'corn-like' body. The projection was removed through an incision on the inner border of the toe.

Note the pedunculated process of bone projecting upwards.

N.B.—The dark ring is due to the patient having cauterized the toe with silver nitrate.

[*Mr. Coupland.*]

Fig. 205.—Subungual Exostosis. (*See Fig.* 26.)

Occurred in a boy of 17, and had been causing trouble for nine months. It was treated as in the last case.

A stout sessile process is apparent projecting inwards and upwards†.

[*Mr. Braithwaite.*]

* The reason for the direction of these processes away from the ligament, the pull of which caused them, has been the subject of discussion. The probable explanation is that the ligament, dragging upon the bone, causes a reaction. Once started, the bone grows in the direction of the parent bone, that is, away from the growing epiphysis. In the case of the knee, the commonest situation, they grow upwards from the femur, and downwards from the tibia.

After the period of growth these projections, serving no useful function, tend to undergo disuse-atrophy, but may need removal. They are of frequent occurrence in rickets (*see Figs.* 110 and 188).

† There has been much conjecture as to the causation of these exostoses. Ingrowing toe-nail is almost confined to the great toe, as is also the subungual exotosis. May not the irritation of the former—during the period of growth—cause the latter?

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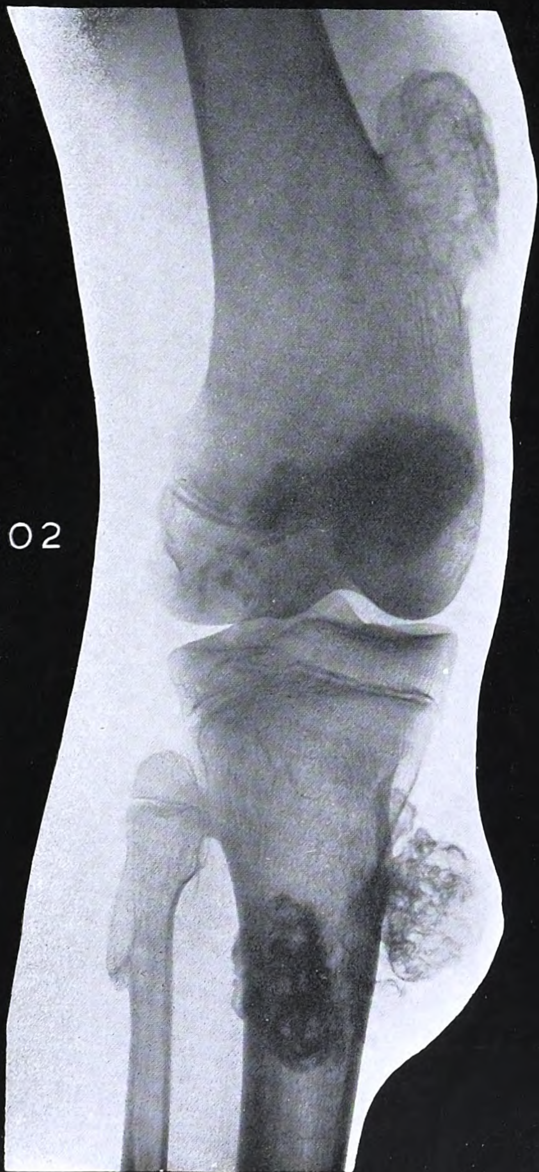

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DISEASES OF BONES, continued.

Figs. 206–209.—Enchondromata.

Fig. 206.—Enchondromata of Hand. (*See Fig.* 42.)

The fingers show irregularities in contour due to underlying radiolucent tumours of cartilage.

These have greatly expanded the bone, and in places have broken through the bony shell. The radius also is the seat of disease.

Fig. 207.—Enchondroma of Phalanx: Calcareous Degeneration. (*See Fig.* 4.)

The tumour is an enchondroma originating in the second phalanx. It has undergone calcification.

Note the swelling of the finger, and the absence of any wasting above or below. Compare this with the condition in tuberculosis shown in *Fig.* 157.

Fig. 208.—Enchondroma of Ulna. (*See Fig.* 34.)

The arm shows a marked deformity due to the presence of a large mass of bone developed in the ulna. The mass is an enchondroma which has undergone calcification in parts.

Fig. 209.—Enchondroma of Foot. (*See Fig.* 24.)

A large mass is present on the foot, the result of an underlying tumour, believed to be an enchondroma, which had calcified.

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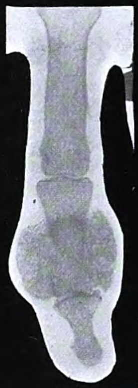

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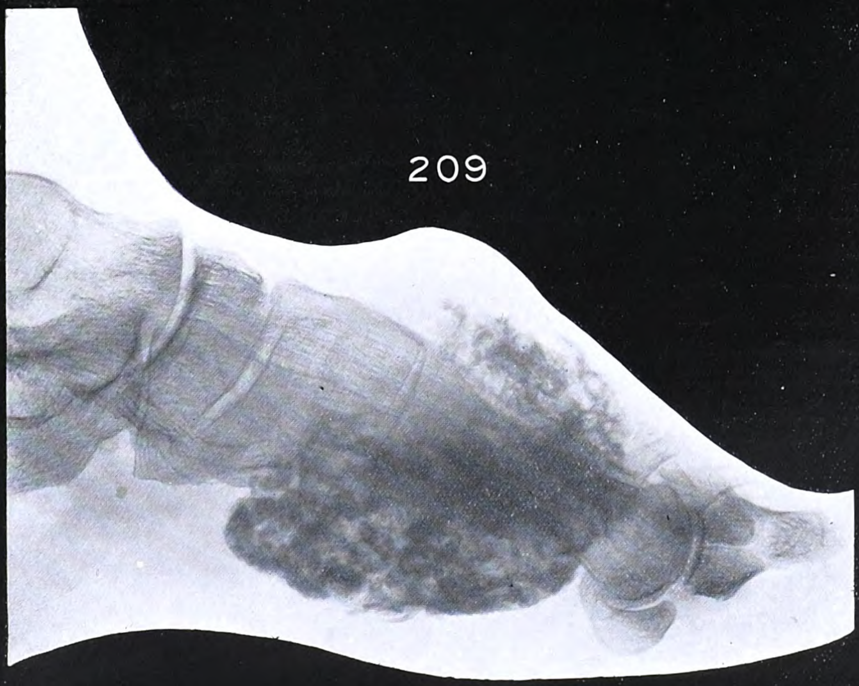

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DISEASES OF BONES, continued.

Fig. 210.—Periosteal Sarcoma of Femur. (*See Fig.* 23.)

An indefinite mass containing lime salts is growing from the surface of the bone. Slender spicules of bone give it a prickly appearance, and it is these which are pathognomonic of the condition. Ossification is a very common feature of this form of sarcoma, and the print shows the spicules of bone arranged at right angles to the shaft in the usual way.

Fig. 211.—Myeloma of Femur. (*See Fig.* 22.)

The cancellous lower end of the femur is seen to be enlarged by a central tumour, with a defined edge above and below. The bone has been largely absorbed, but osseous trabeculæ appear to ramify in the tumour mass. Above the patella the compact wall has disappeared, and the tumour is here probably covered only by periosteum.

Fig. 212.—Osteoma of Humerus. (*See Fig.* 41.)

A youth of 15 complained of pain between the finger and thumb, which prevented his working. Examination showed a bony tumour attached to the outer side of the humerus, about its middle. It was not tender.

The plate shows a nodule of new bone in the neighbourhood of the musculo-spiral nerve similar in structure to the exostoses in *Fig.* 202.

The area of pain is difficult to interpret, unless the radial nerve fibres of the musculospiral nerve were implicated.

Contrast with the irregularity of a sarcoma (*see Fig.* 210).

[*Mr. Dobson.*]

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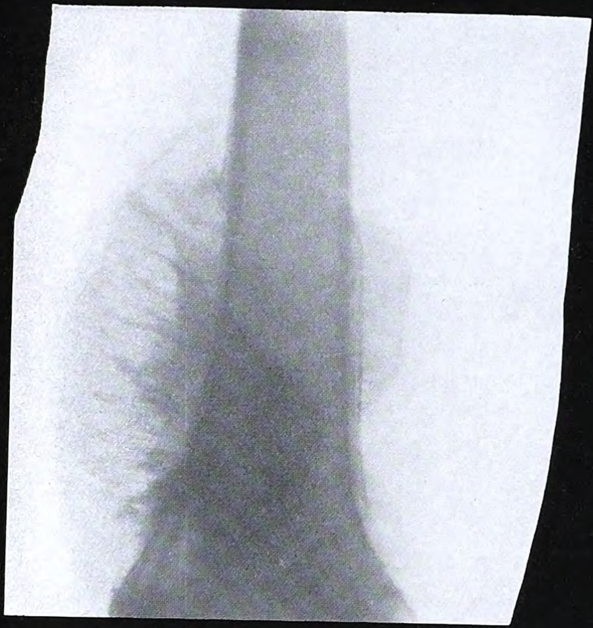

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DISEASES OF BONES, continued.

Fig. 213.—Sarcoma of Scapula. (*See Fig.* 52.)

A girl, age 12, complained of swelling of the shoulder. There was a huge mass in the region of the scapula filling up the axilla. Movement of the arm was free.

The scapula is seen to be entirely replaced by a hazy mottled mass, except the tip of the acromion, which shows rarefaction.

The case was treated by Coley's fluid and deep X-ray therapy, with the result that the tumour disappeared, and there was no recurrence two months later.

[*Sir Berkeley Moynihan, Bt.*]

Fig. 214.—Intramedullary Sarcoma of Tibia. (*See Fig.* 22.)

The density of the upper part of the tibia is much reduced by the presence within it of an intramedullary sarcoma. The bone is definitely expanded.

Fig. 215.—Osteoma of Radius. (*See Fig.* 18.)

An irregular mass of new bone of slight density is growing from the tuberosity of the radius. Its regular edge and its structure excluded the diagnosis of malignant disease.

Fig. 216.—Myeloma of Humerus. (*See Fig.* 33.)

The absence of muscular wasting excludes the diagnosis of tuberculous disease.

A large tumour occupies the upper end of the humerus; from its walls project the trabeculæ which are pathognomonic—radiologically—of the condition.

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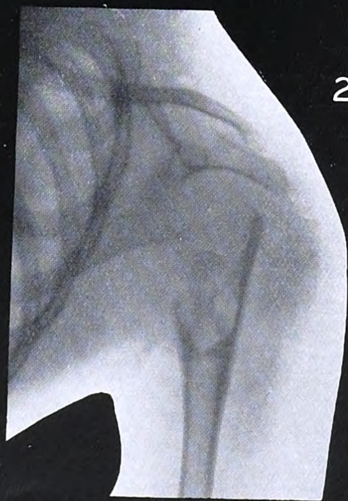

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DISEASES OF BONES, continued.

Fig. 217.—Primary Sarcoma of Skull. (*See Fig.* 14.)

An intelligent history was hard to obtain. The man, age 57, had a 'lump' about the position of the anterior fontanelle from birth. It was removed twelve years ago, but recurred almost immediately; it was found to be fluid. Six months ago it hardened, and four months later clear fluid began to ooze from it.

Examination showed a hard irregular mass over the vertex with a suggestion of egg-shell crackling.

X rays reveal a bony tumour intimately associated with the swelling of the scalp. It has the appearance of a sclerosed boss with spicules radiating from it.

The skull is very similar to a larger specimen presented to the Royal College of Surgeons, England, by the late Mr. Ward (R.C.S. 1649.1, Special Path. Sect.).

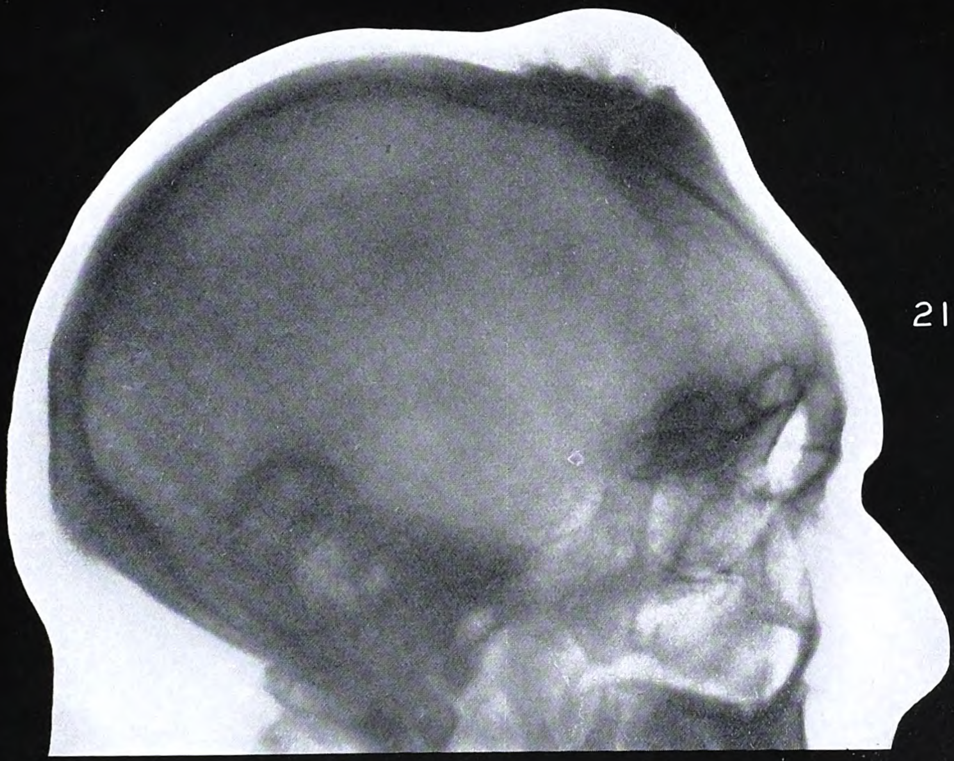
[*Mr. Thompson.*]

Fig. 218.—Secondary Sarcoma of Skull. (*See Fig.* 15.)

The patient, a boy of 13, had his leg amputated at the hip for periosteal sarcoma of the femur. There has been no local recurrence. A small lump appeared some twelve weeks ago on the left parietal bone, and has grown rapidly during the last four weeks. It has become intensely painful, and is accompanied by incessant vomiting. The boy's mental powers are good.

A prominence is evident over the left parietal bone, due to an underlying hazy deposit of new bone of a mottled character.

[*Mr. Dobson.*]



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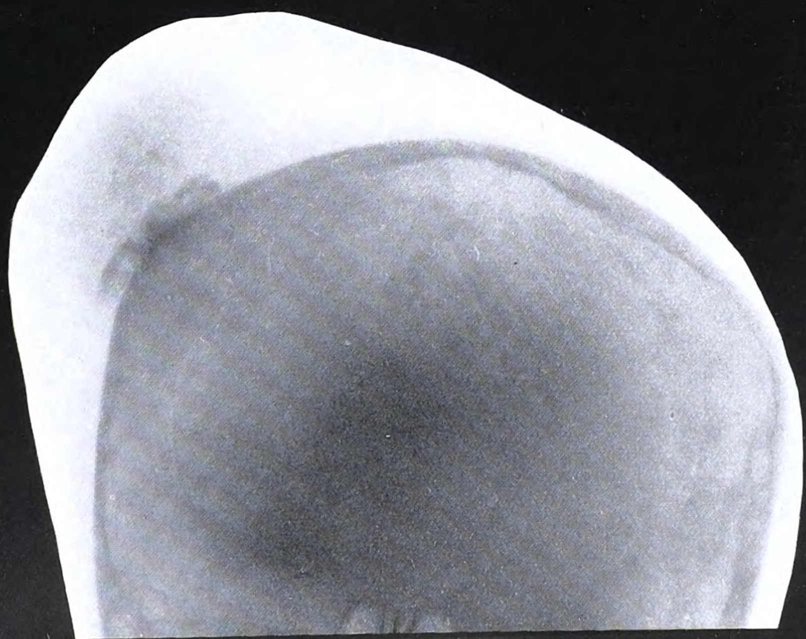

DISEASES OF BONES, continued.

Fig. 219.—METASTATIC HYPERNEPHROMA IN FEMUR. (*See Fig.* 21.)

The patient, a woman of 49, had a history of painless hæmaturia five years previously. Two years ago nephrectomy was done, when the tumour removed was said not to be a sarcoma. For two or three weeks she has had a sense of weakness in the thigh, and a feeling as if the bone were bending, causing her to limp. Then a spontaneous fracture occurred, and she was admitted to hospital.

The plate shows that the shaft for about three inches has been absorbed, and connected with the gap thus made is an expanded globular growth, with evidence of scattered and irregular bone patches. These are chiefly the remains of the shaft, but may be, in some instances, of new formation.

[*Mr. Daw.*]

Fig. 220.—METASTATIC OVARIAN CARCINOMA IN FEMUR. (*See Fig.* 21.)

The patient, age 47, feeling in good health, and not losing weight, was found to have an inoperable carcinoma of the ovary, with secondary deposits in peritoneum, liver, humerus, and femur.

The normal bony tissue of the great trochanter, especially, and the neck is being replaced by tumour formation. The whole has a mottled appearance. The joint, as usual, is unaffected.

[*Mr. Oldfield.*]

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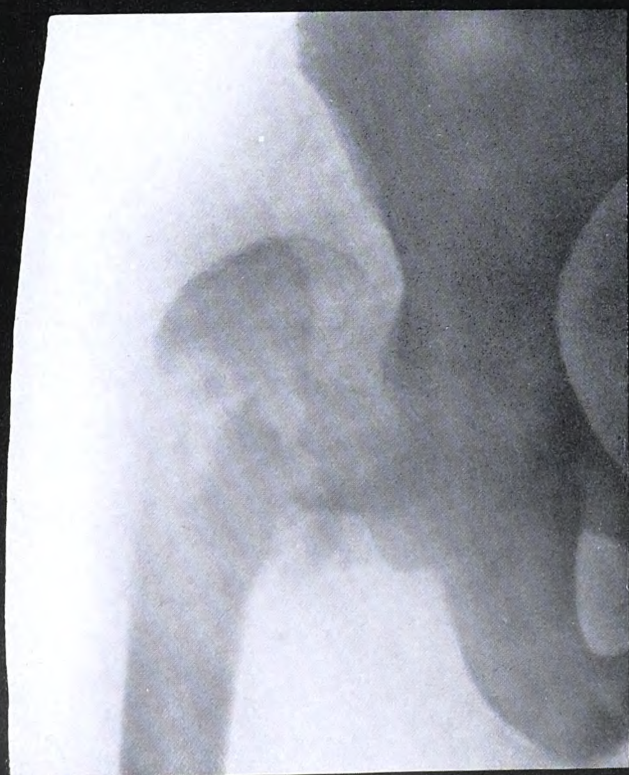

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PART V.

INJURIES AND DISEASES OF JOINTS

INJURIES AND DISEASES OF JOINTS.

Figs. 221–233.—Dislocations.

Fig. 221.—Clavicle. (*See Fig.* 16.)

The patient, a lad of 15, fell on his shoulder. Examination revealed a prominence over the acromio-clavicular region, and the neck had lost its usual gentle sweep. (*See Fig.* 65 et seq.) The clavicle appeared shortened, due to its backward displacement, and the distance between the tip of the acromion and the suprasternal notch was decreased on the injured side.

The acromio-clavicular joint is dislocated, the clavicle lying above and behind the acromial facet. The humerus is drawn inwards by the pectoral and latissimus dorsi muscles, thus accounting for the shortened distance referred to. A flake of the clavicle, maintaining its attachment to the conoid and trapezoid ligaments, has been torn off.

[*Mr. Daw.*] [*Brit. Jour. Surg.* 1923, Jan.]

Fig. 222.—Clavicle. (*See Fig.* 27.)

Following a 'scrum', a tender mass appeared at the sternoclavicular joint; weakness of the arm and pain at the site of the swelling developed. At times the patient was dyspnœic. The clavicle could be felt with its inner end displaced upwards and backwards.

At operation two months later, an oblique fracture of the inner end of the clavicle, isolating a wedge-shaped portion of bone—which remained *in situ* —was found. The rest of the clavicle was above and behind.

Note the upward and backward dislocation of the clavicle, evidenced by obliteration of the space between clavicle and 2nd rib on the injured side.

Fig. 223.—Elbow. (*See Fig.* 51.)

This occurred in a boy, age 14, as the result of a fall. The arm assumed this position midway between flexion and extension, with an anterior fullness, which is typical of the condition, and a loss of resistance posteriorly.

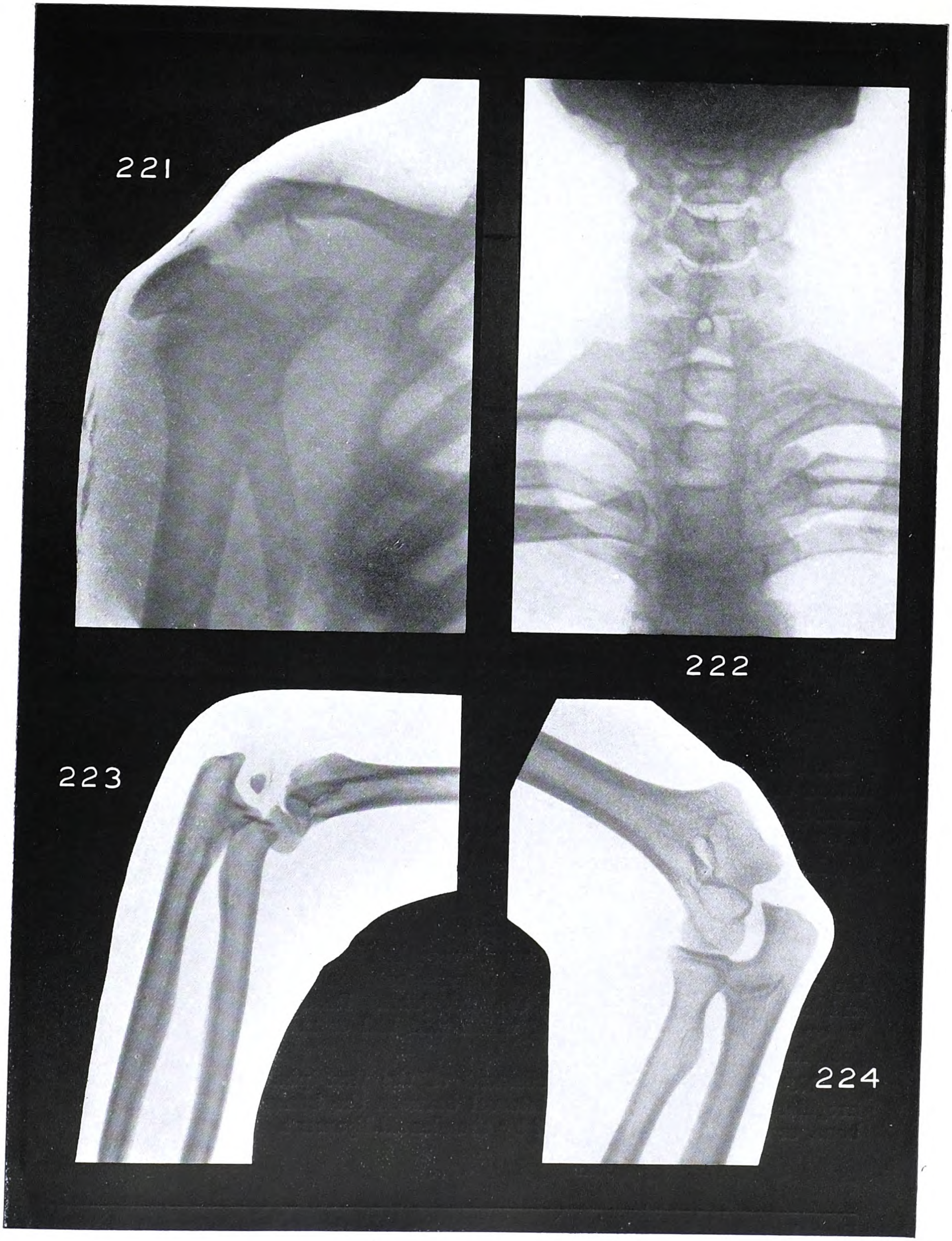
The articular surface of the ulna is empty, and the humerus lies against the anterior border of the radius. This situation of the humerus causes the anterior fullness, which was found to be very hard. It will readily be seen how the sigmoid fossa can be palpated, in consequence of this loss of resistance posteriorly.

Note that the internal lateral ligament remains intact, having torn off the epiphysis of the internal epicondyle.

Fig. 224.—Elbow. (*See Fig.* 51.)

In this case, a boy of 18, it was difficult to interpret the curious displacement. Examination showed an internal dislocation. Reduction was easy.

The position of screening was bad owing to the deformity. The ulnar surface of the humerus apparently articulates with the head of the radius, the capitellum of the humerus lying free, away from the joint. The inner epicondylar region is jagged, the internal epicondyle having been torn off; it lies at the level of the upper border of the olecranon.



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INJURIES AND DISEASES OF JOINTS, continued.

Figs. 225-229.—Dislocations (*continued*).

Fig. 225.—Radius. (*See Fig.* 18.)

The head of the radius lies in front of the joint. There is a healed fracture of the shaft of the bone. The ulna and radius show some rarefaction, possibly the result of disuse following the accident.

Fig. 226.—Metacarpal. (*See Fig.* 4.)

As the result of an accident, a swelling appeared over the inner border of the hand.

X rays revealed a dislocation of the fifth metacarpal at both proximal and distal joints. The displaced metacarpal has led to deviation of the fourth finger to the ulna side.

[*Mr. Richardson.*]

Fig. 227.—Wrist. (*See Fig.* 19.)

Mark the increase in the depth of the wrist due to a dislocation of the os magnum backwards. The articular surface of the semilunar is visible. The os magnum is lying on the dorsum of that bone.

Fig. 228.—Phalanx. (*See Fig.* 4.)

The tip of the thumb was bent backwards with this result. It shows a typical fullness in front of and behind the first phalanx, and a general shortening. The anterior fullness is due to the distal part of the first phalanx, and the posterior to the proximal part of the ungual phalanx.

Mark the clearness of the sesamoid bone.

Fig. 229.—Thumb. (*See Fig.* 42.)

The boy, age 12, had his thumb wrenched backwards. The thumb took the position indicated, with a wide space between thumb and index finger, and backward displacement at the first joint. Reduction was only possible by operation, the final result of which was bad cosmetically, but moderately good functionally.

Note the backward displacement of the first phalanx. There is some irregular bone in the angular interval between the bones, either the sesamoid bone, or a flake of bone torn off by the glenoid ligament.

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INJURIES AND DISEASES OF JOINTS. continued.

Figs. 230-233.—Dislocations (*continued*).

Fig. 230.—Fracture Dislocation of the External Femoral Condyle. (*See Fig.* 22.)

The external condyle of the femur has been separated from the shaft by an inverted L-pattern fracture, and has lost contact with the tibia.

The bones show definite senile changes (*see Fig.* 271).

Calcification has occurred in the popliteal artery, which is tortuous, and in the posterior tibial and saphenous arteries (*see Fig.* 154).

[*Mr. Daw.*]

Fig. 231.—Ankle. (*See Fig.* 24.)

The tibia seems to be displaced forwards, and to be resting on the anterior edge of the articular surface of the astragalus. The fibula appears to be displaced a little backwards on the astragalus, but this may be only in appearance, not in reality. The parts have been screened somewhat obliquely, and the concave side-to-side upper surface of the astragalus is shown. This, however, maintains its natural level with regard to the internal and external malleoli.

Fig. 232.—Mid-tarsal Dislocation. (*See Fig.* 25.)

The man slipped his foot into a crevice, and his ankle became deformed and acutely painful.

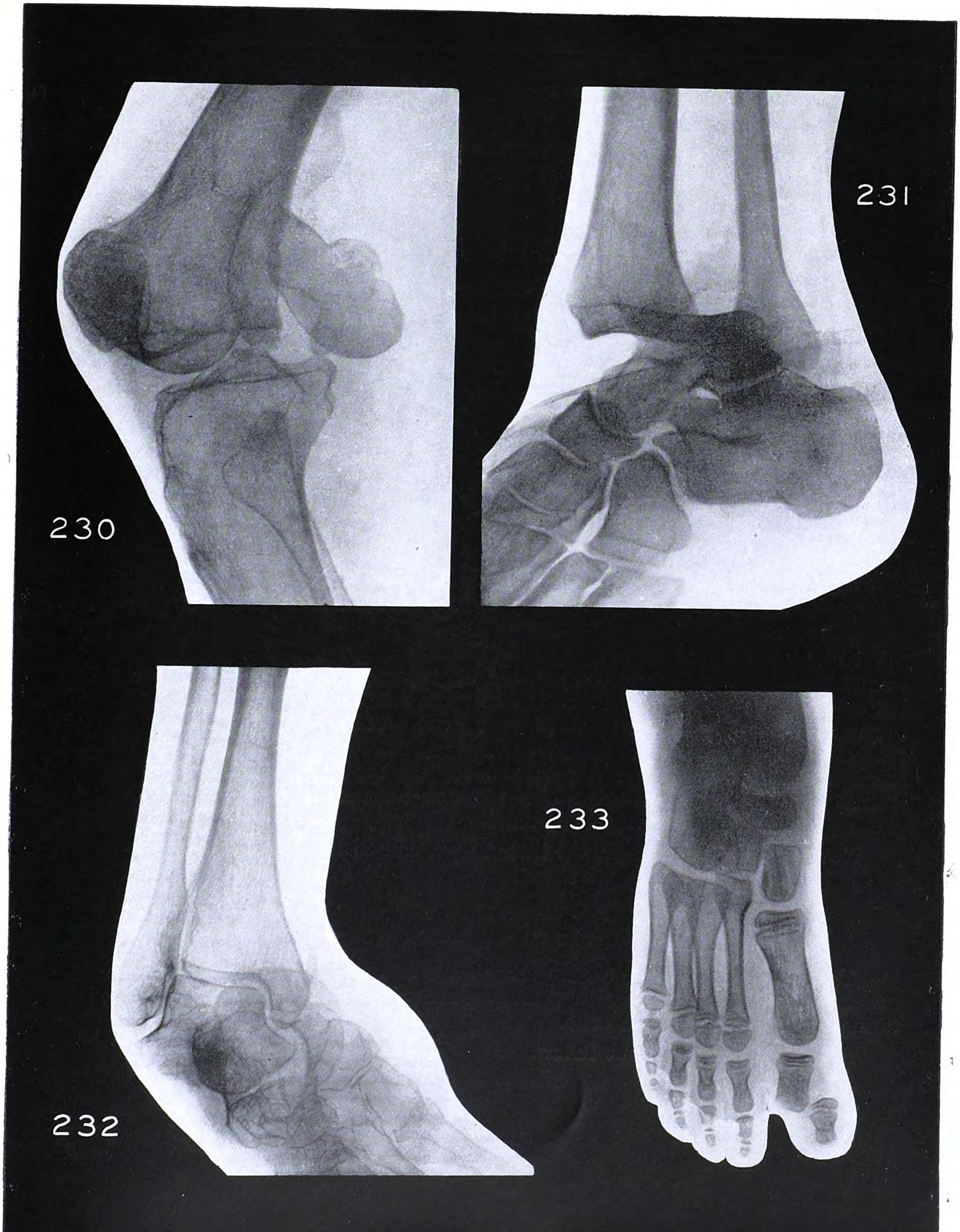
Note the wrenching inwards of the whole foot just distal to the ankle, so that the profile resembles a lateral rather than an antero-posterior one. This appearance is due to the inward dislocation of the foot at the astragalo-scaphoid joint.

Reduction was readily accomplished.

[*Mr. Knaggs.*]

Fig. 233.—Hallux. (*See Fig.* 40.)

The great toe projects from the metatarsophalangeal joint, and a space, due to a dislocation of the ungual phalanx, separates it from the second toe.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INJURIES AND DISEASES OF JOINTS, continued.

Fig. 234.—Gunshot Wound of Wrist. (*See Fig.* 20.)

The whole of the wrist-joint was shattered as the result of the wound.

Fig. 235.—Synovitis of Knee. (*See Fig.* 46.)

The child, age 9, had a painless swelling of both knees. The bridge of the nose was sunken, and the Wassermann reaction positive.

The radiograph demonstrates absence of arthritis, and absorption of lime salts. Note the transverse striæ in the long bones (*see Figs.* 135, 149).

[*Mr. Coupland.*]

Fig. 236.—Septic Arthritis of Wrist. (*See Fig.* 20.)

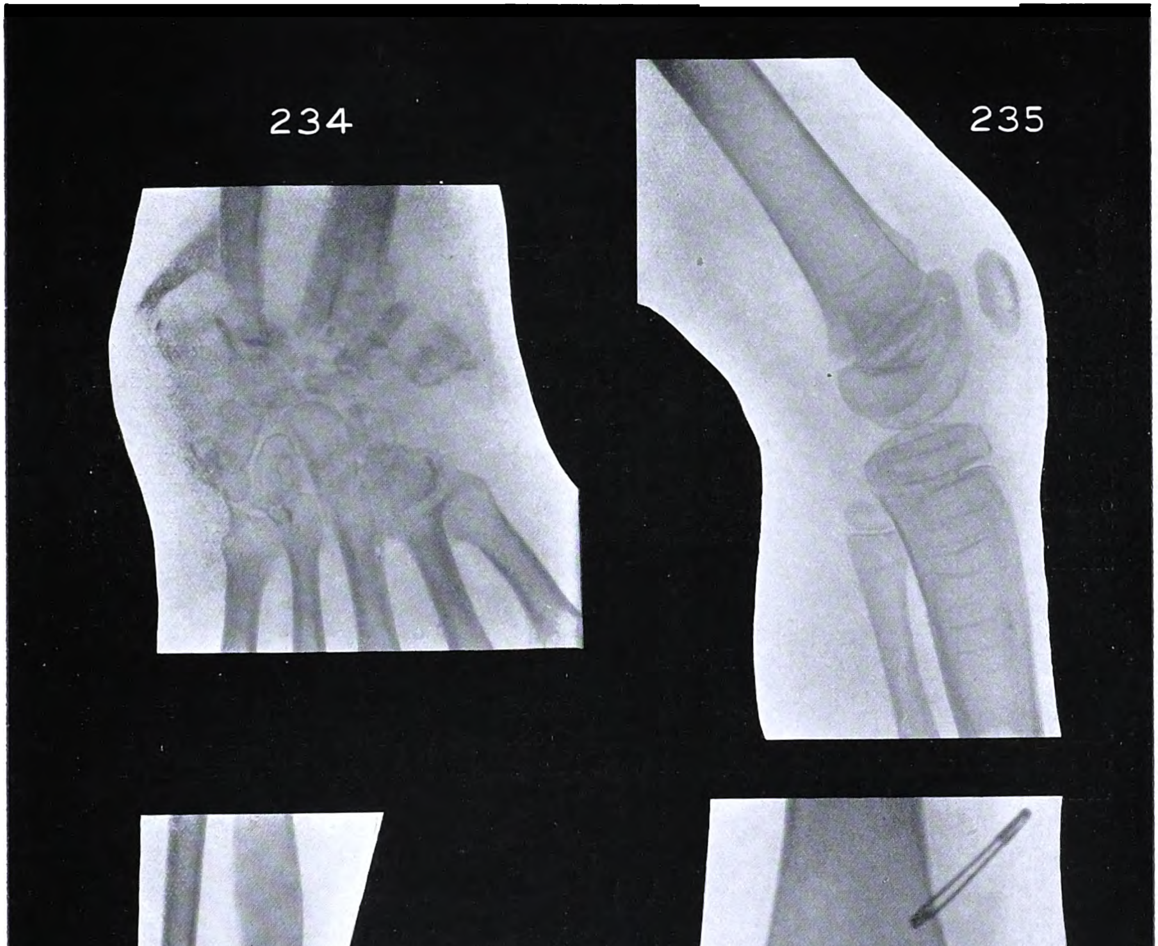
Notes were unobtainable. The condition was possibly due to a gunshot wound. Probably there was a compound fracture of the radius which was wired, but sepsis supervened, with destruction of the whole carpus and lower end of the radius; possibly sequestrotomies were done. The ulna was not involved, so the hand has been displaced bodily to the radial side. The result is that a line through the third metacarpal will pass along the radial border of the forearm, instead of up the middle of it. The position assumed is that of Madelung's disease, no angulation having occurred.

Note the prominence near the little finger, caused by the end of the ulna.

Fig. 237.—Arthritis of Knee. (*See Fig.* 54.)

The disease is limited to the inner part of the joint; the inner articular surfaces are hazy and rarefied. An extra-articular abscess has formed, necessitating drainage. Note the tube.

Ankylosis will no doubt follow.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INJURIES AND DISEASES OF JOINTS, continued.

Figs. 238–261.—Tuberculous Joints.

Fig. 238.—Shoulder. (*See Fig.* 16.)

There is a conspicuous lack of fullness in the deltoid region, and a decreased axillary girth (*see Fig.* 8). The position of slight abduction assumed is the ideal one for ankylosis.

The head of the humerus is much shrunken and rarefied; nearly all the greater tuberosity has disappeared. The head has lost its usual sharpness of outline, and passes insensibly into the scapula, with which ankylosis has occurred. The glenoid fossa and tips of the acromion and clavicle are deficient in lime salts.

Fig. 239.—Wrist. (*See Fig.* 20.)

The whole of the carpus is 'fuzzy', exactly as if the patient had moved during the exposure, as also is the styloid process of the radius. The lower end of the radius, first metacarpal, and to a less extent the other metacarpals, are deficient in lime salts.

Fig. 240.—Elbow. (*See Fig.* 17.)

The whole joint looks hazy, as though powder had been sprinkled on the plate before printing. The lower end of the humerus passes imperceptibly into the ulna, meaning that ankylosis has occurred. The head of the radius is eroded. (Its apparent increase in density is due to superimposition of the ulna.) Frail bony processes project from the humerus and ulna. A sequestrum, almost free from lime, is lying among the muscles.

Fig. 241.—Elbow. (*See Fig.* 18.)

The articular end of the humerus has disappeared. The joint has been completely destroyed, and ankylosis of the humerus with the ulna, and almost certainly with the radius, has occurred. Sequestra are seen posteriorly.

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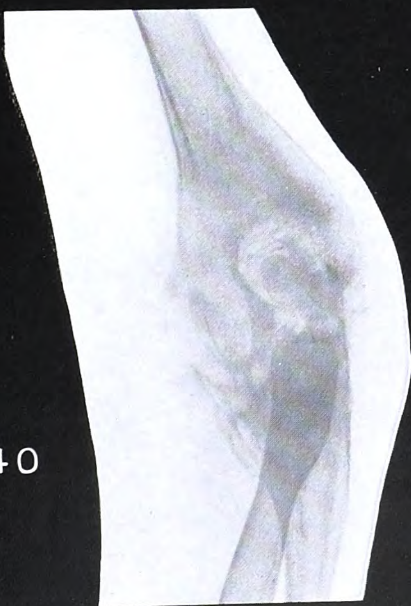


INJURIES AND DISEASES OF JOINTS, continued.

Figs. 242-245.—Tuberculous Joints (*continued*).

Fig. 242.—Ischium. (*See Fig.* 49.)

A girl of 11 was admitted in consequence of typical tuberculous sinuses on the buttock. The hip movements were perfect.

Note that the tuber ischii is almost completely eaten away.

[*Mr. Flint.*]

Fig. 243.—Ilium. (*See Fig.* 37.)

The ilium has a mottled appearance, areas of rarefaction being surrounded by sclerosis. The margin of the bone is irregular.

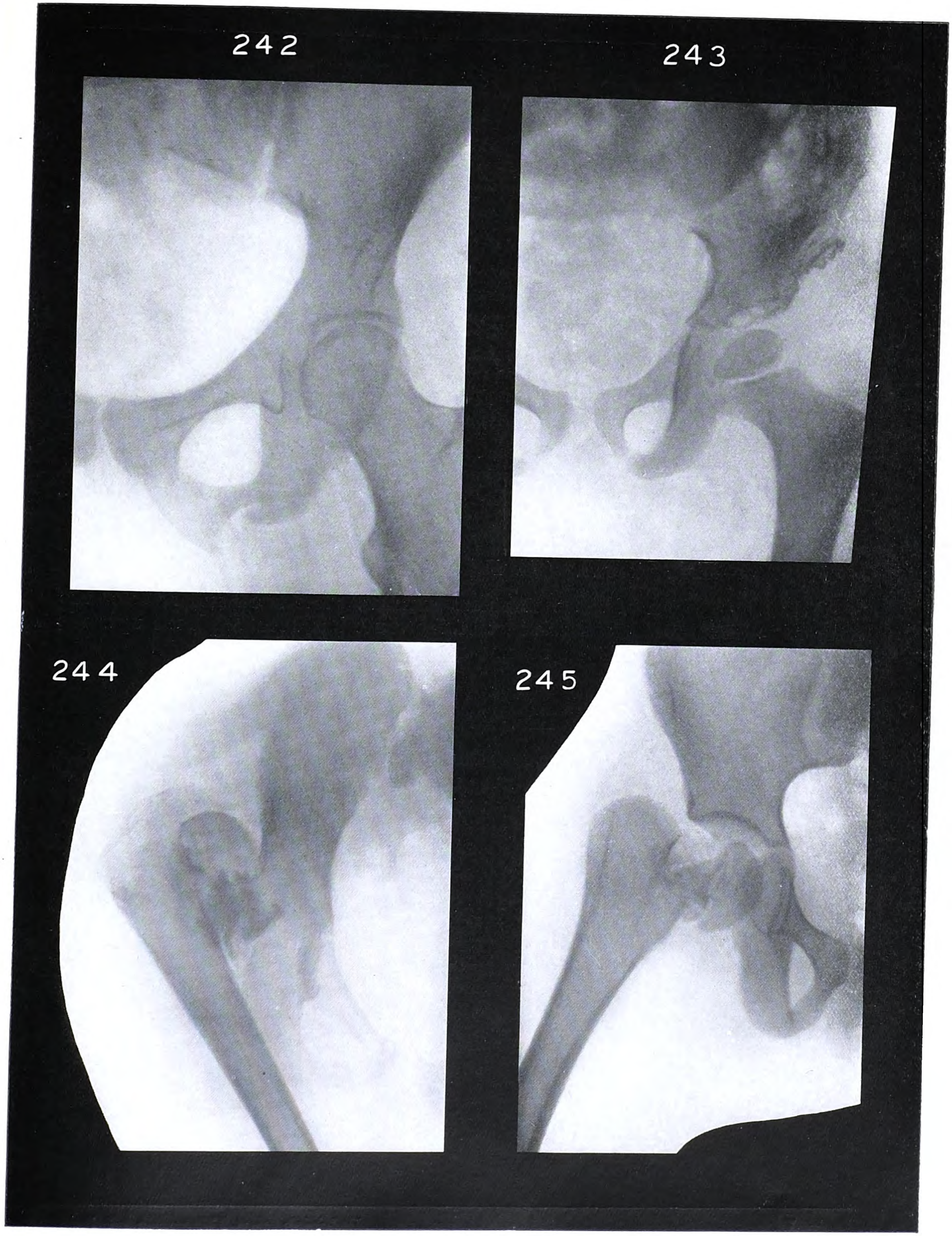
Fig. 244.—Hip: Pathological Dislocation. (*See Fig.* 45.)

This occurred in a boy, age about 12.

Mark the great increase in fullness of the buttock, due to the projection of the great trochanter. The head and neck of the femur have separated from the shaft. The head is lying free some distance above the acetabulum, and its articular surface looks upwards. The acetabulum is indefinite, its rim having disappeared. The neck of the bone has become a dense sequestrum, lying free below the head. The shaft has been drawn upwards and adducted. The pelvis has been tilted up on the diseased side. These three factors will cause great shortening of the limb.

Fig. 245.—Hip: Treated. (*See Fig.* 45.)

The conditions here are similar to those in *Fig.* 244, but the limb has been treated by abduction. Note the good position of the bone established. The upper part of the acetabulum is irregular and rarefied, and there are considerable masses of dead bone. The position is an ideal one for ankylosis.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INJURIES AND DISEASES OF JOINTS, continued.

Figs. 246-249.—Tuberculous Joints (*continued*).

Fig. 246.—Hip: Wandering Acetabulum. (*See Fig.* 21.)

The appearance of the buttock is characteristic of a pathological dislocation. The head of the bone and the upper part of the rim of the acetabulum have been slowly worn away. Displacement in the direction of the dorsum ilii has gradually taken place, and the skiagram would suggest that ankylosis has occurred. The lower part of the extended acetabulum is rarefied and atrophic.

Fig. 247.—Hip: Adult. (*See Fig.* 21.)

Only a suggestion of the acetabulum remains. The head and neck of the femur have disappeared, and the rest of the shaft has been displaced upwards on the dorsum ilii, where it has become ankylosed.

Fig. 248.—Ankylosis of Hip. (*See Fig.* 37.)

The patient was evidently about four years of age. The hip-joint has disappeared, the shaft of the femur being united to the acetabulum by a mass of new bone. The cause was probably tubercle.

Fig. 249.—Hip. (*See Fig.* 37.)

The diagnostic feature of this plate is the blurred appearance of the joint just as though it were a poor radiograph. There has been considerable destruction of the upper part of the head, which may lead to pathological dislocation.

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INJURIES AND DISEASES OF JOINTS, continued.

Figs. 250–251.—Tuberculous Joints (*continued*).

Fig. 250.—Knee: Adult. (*See Fig.* 22.)

This case is an early one, loss of the usual distinctness being the main characteristic. There is a haziness about the articular margins of the tibia. The femur and patella are regular in outline, but deficient in lime salts.

Fig. 251.—Knee: Adult. (*See Fig.* 22.)

This is a more advanced case than *Fig.* 250. Two of the features of the classical 'triple displacement' of the knee are indicated—namely, flexion and dsplacement of the tibia bodily backwards. Part of the articular surfaces of the femur and tibia respectively lie free anteriorly and posteriorly. The tibia is ankylosed to the femur, as is also the patella. The bone in the vicinity is rarefied.

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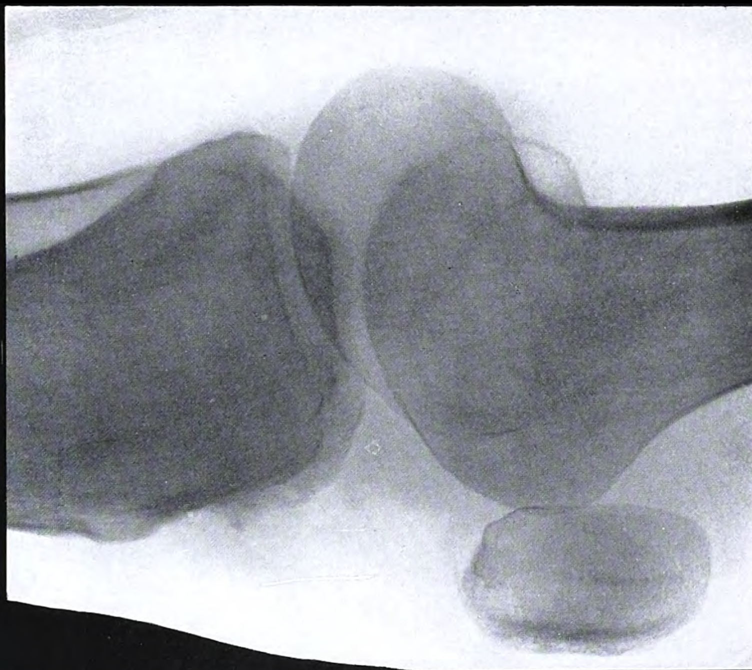

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INJURIES AND DISEASES OF JOINTS, continued.

Figs. 252-255.—TUBERCULOUS JOINTS (*continued*).

Fig. 252.—KNEE: CHILD. (*See Fig.* 30.)

There is apparently marked disease of the lower end of the diaphysis of the femur, extending into the cartilaginous epiphysis. The synovial membrane is extensively affected, and its outline is visible, especially in the lower part, where its contour is defined.

The swollen knee and wasting of the calf muscles are shown by the silhouette.

Fig. 253.—KNEE. (*See Fig.* 30.)

A condition of the synovial membrane similar to the last is apparent, and there is rarefaction of the ossific nucleus of the tibial epiphysis.

Fig. 254.—KNEE: STARTING IN THE TIBIA. (*See Fig.* 38.)

The patient, a boy of 4, had become "knock-kneed" during the last few weeks. He had not complained of pain.

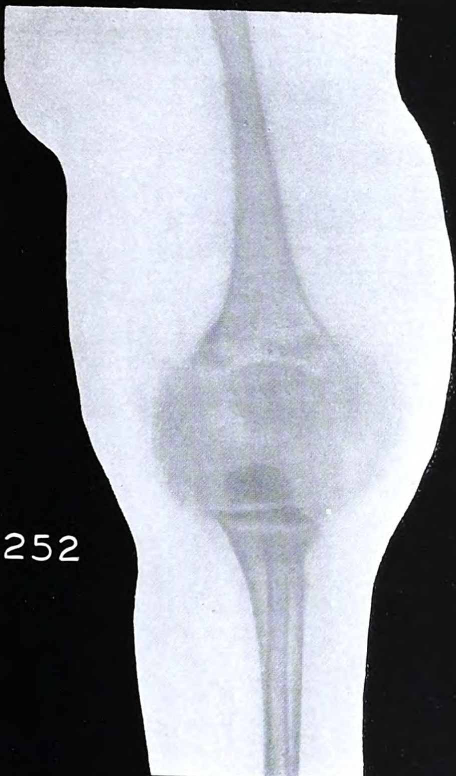
Note the distinct genu valgum. This is due to loss of the support of the external condyle of the femur, the result of massive tuberculous disease involving the outer part of the tibia. The epiphysis of the tibia also is affected. The abscess over the head of the fibula is somewhat opaque to the rays, owing, no doubt, to the large calcium contents of its fluid.

The abscess was scraped. The granulation tissue showed microscopical evidence of tuberculous disease.

[*Mr. Braithwaite.*]

Fig. 255.—KNEE. (*See Fig.* 46.)

The articular surfaces of both bones are eroded. The patella is lifted up by the swelling of the joint, due to either fluid or thickened synovial membrane.



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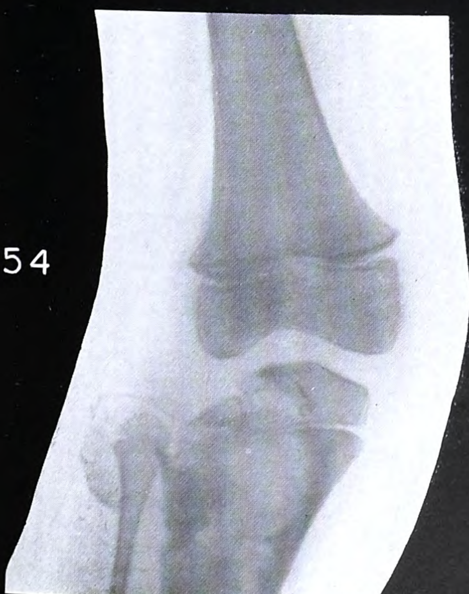

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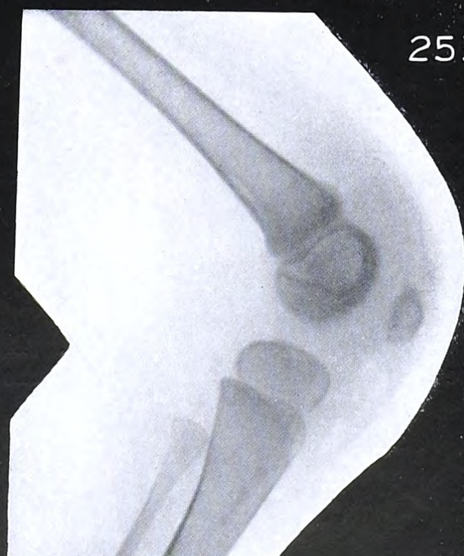

INJURIES AND DISEASES OF JOINTS, continued.

Figs. 256–259.—Tuberculous Joints (*continued*).

Fig. 256.—Tuberculous Cavity in the Os Calcis. (*See Fig.* 24.)

The patient, a woman, age 50, had a chronic sinus on the outer side of the foot for twelve months. There were no signs of tabes.

A round area of comparative transparency is obvious beneath the level of the sustentaculum tali; the rest of the bone is normal. In the area of rarefaction is a sequestrum.

[*Mr. Collinson.*]

Fig. 257.—Os Calcis. (*See Fig.* 56.)

Note the massive swelling of the heel.

The os calcis has disappeared, save for its anterior end and a few vestiges here and there. The case was probably one of tuberculous infiltration. What is left of the os calcis is denser than the surrounding bones. These are atrophic (*see Fig.* 146).

N.B.—The circular area below the os calcis is an artefact on the negative.

Fig. 258.—Tarsus. (*See Fig.* 24.)

The tarsus appears welded together, except the ankle-joint, the calcaneo-cuboid articulation, and the articulation of the internal cuneiform with the first metatarsal. This emphasizes the intercommunication of certain joints of the foot.

Fig. 259.—Tarsus: Youth. (*See Fig.* 57.)

Note the swelling of the ankle. The same joints are involved as in *Fig.* 258. The bones in the neighbourhood of the disease are less dense than normal.

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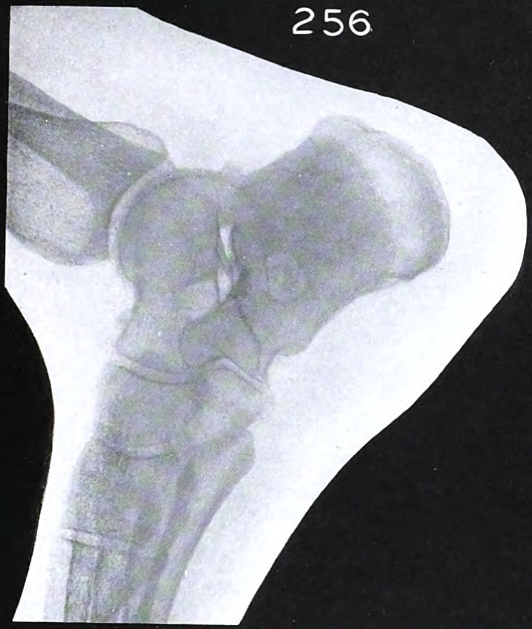

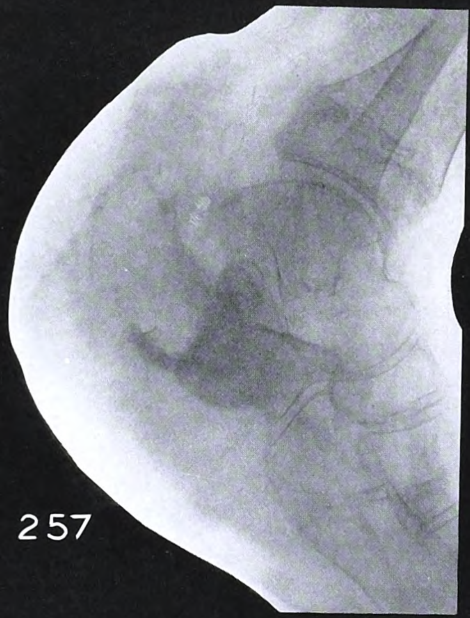

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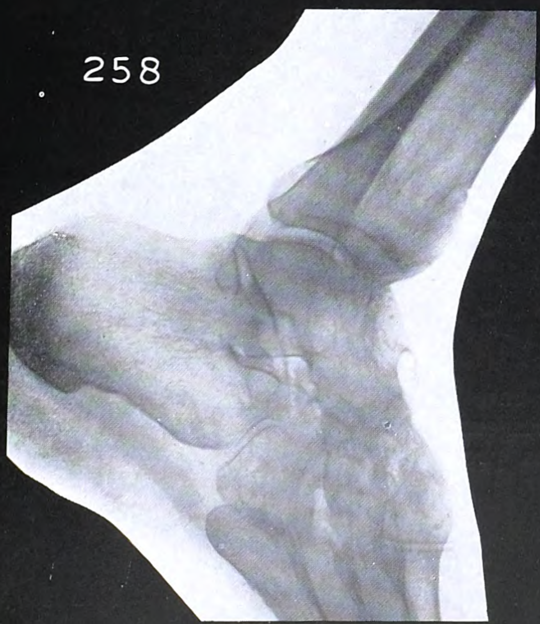

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INJURIES AND DISEASES OF JOINTS, continued.

Figs. 260–263.—Charcot's Joints.

Figs. 260, 261.—Hip. (*See Fig.* 21.)

The right and left hips of a case of tabes are shown.

The head and almost the whole of the neck of the right femur have disappeared. The acetabulum is depressed and expanded, its rim is osteophytic, and there are signs of ossification in the capsule. Destruction is much more in evidence than new bone formation, but the latter is probably greater than is shown in the skiagram.

The left femur, *Fig.* 261, is deficient in lime salts, and presents an osteophyte at the lower part of the head. This may develop into a Charcot's joint.

Fig. 262.—Elbow: Hypertrophic. (*See Fig.* 18.)

A case of syringomyelia. The patient had some pain two years ago, but since then the joint has been painless, but flail-like and useless. Subjective symptoms were present, but no pain. Knee-jerks were normal. There was loss of sensation of heat and cold.

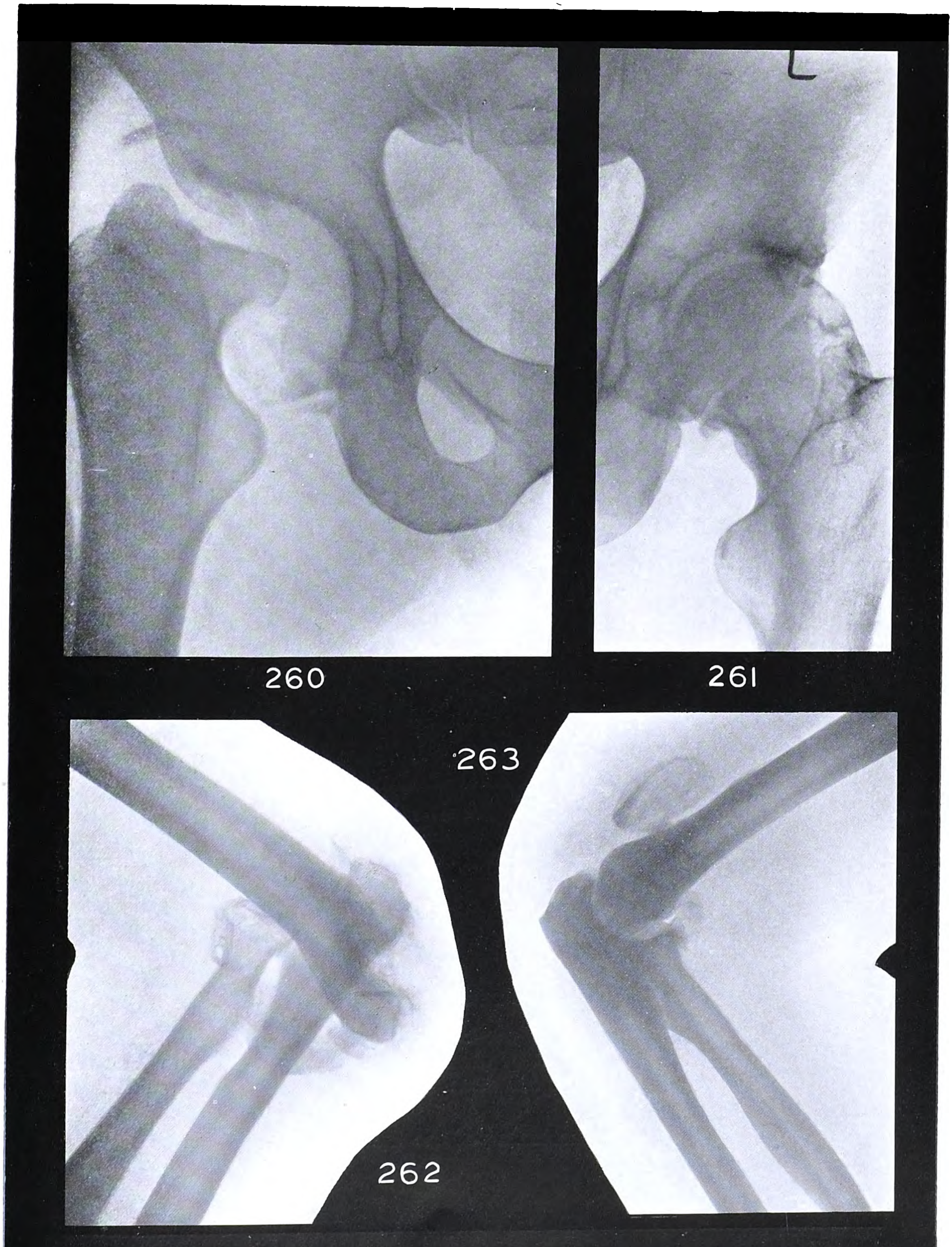
Observe the complete disintegration of the joint and the masses of new bone formation; the bones are hopelessly entangled. The formation of osteophytes some distance from the joint is characteristic of the disease.

This is the commonest joint affection.

[*Dr. Burrow.*]

Fig. 263.—Elbow. (*See Fig.* 18.)

No notes were available, but the case has been inserted here in the belief that the condition was probably syringomyelia. The end of the humerus is atrophic, and mushroom-like growths project from the humerus above the articulation.



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INJURIES AND DISEASES OF JOINTS, continued.

Fig. 264.—Coxa Vara. (*See Fig.* 49.)

The neck makes an angle of less than a right angle with the shaft of the femur. While the upper border of the neck lies at right angles to the shaft, the lower border presents a marked lipping, similar to that which would be produced by pressure of the acetabulum on bone which had become soft. The lower part of the head is more transparent than normal. The calcar femorale is curved.

[*Mr. Daw.*]

Fig. 265.—Congenital Dislocation of the Hip. (*See Fig.* 37.)

For this girl, age 15 months, advice was sought on account of lateness and clumsiness in the attempt to walk. There was some increase in the prominence of the left great trochanter; all movements except abduction were free. Telescopic movement was obtained. The right hip was normal.

Note the acetabulum has not developed and is empty. The head of the femur rests on the dorsum ilii. The head of the femur is normal. If the condition was allowed to go untreated a false joint would form, the head of the femur would become mushroomed, and the neck shortened.

[Mr. *Braithwaite.*]

Fig. 266.—Pseudo-coxalgia (Legge-Calvé-Perthés Disease). (*See Fig.* 37.)

The child, age 7, was brought on account of a limp which gradually developed without any assignable cause. Examination showed some limitation of abduction, and slight interference with flexion.

The head of the femur is much increased in size, and its articular surface is mushroomed, so that the epiphyseal line of the head is lengthened. The neck of the bone has not developed, and Shenton's line has lost its regularity. The acetabulum is shallow to accommodate the large head.

[*Mr. Daw.*]

Fig. 267.—Pathological Dislocation of Hip. (*See Fig.* 37.)

Note the typical appearance of the buttock. This is due to the prominence of the great trochanter, the result of the femur lying on the dorsum ilii. The acetabulum has almost disappeared. The head of the femur is expanded and ankylosed to the ilium.

Notice the cause of the shortening of the limb which occurs in these cases.

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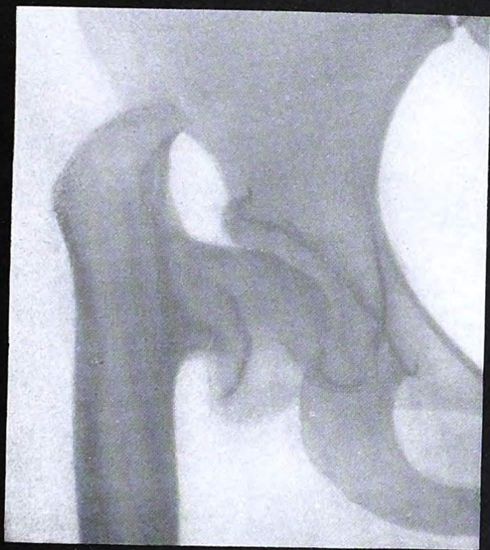

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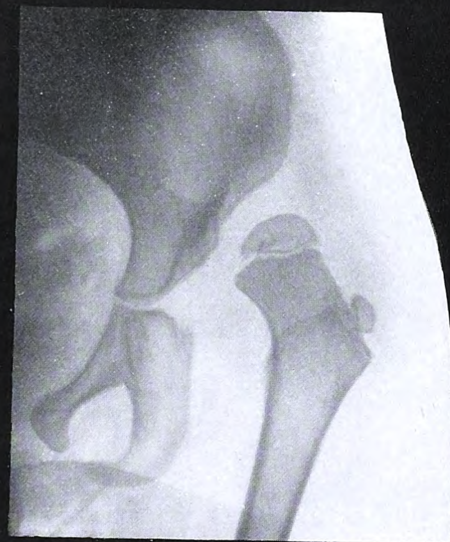

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INJURIES AND DISEASES OF JOINTS, continued.

Fig. 268.—RHEUMATOID ARTHRITIS. (*See Fig.* 4.)

Note the extreme distortion of the fingers, which are bent at their joints, and show Haygarth's nodes. The bone changes are almost entirely confined to the interphalangeal joints, where osseous outgrowths are apparent. The radius and ulna show some senile change of the nature of rarefaction.

[*Dr. Griffith.*]

Fig. 269.—LOOSE BODY IN KNEE—TRAUMATIC. (*See Fig.* 23.)

This man, age 65, had a slight wrench of his knee, followed by symptoms of a loose body in the joint.

X rays reveal an irregular deficiency on both sides of the condyles of the femur and tibia. The locking complained of was due, no doubt, to the fragments of bone chipped off from these positions becoming free in the joint. The articular surfaces are intact.

[*Mr. Coupland.*]

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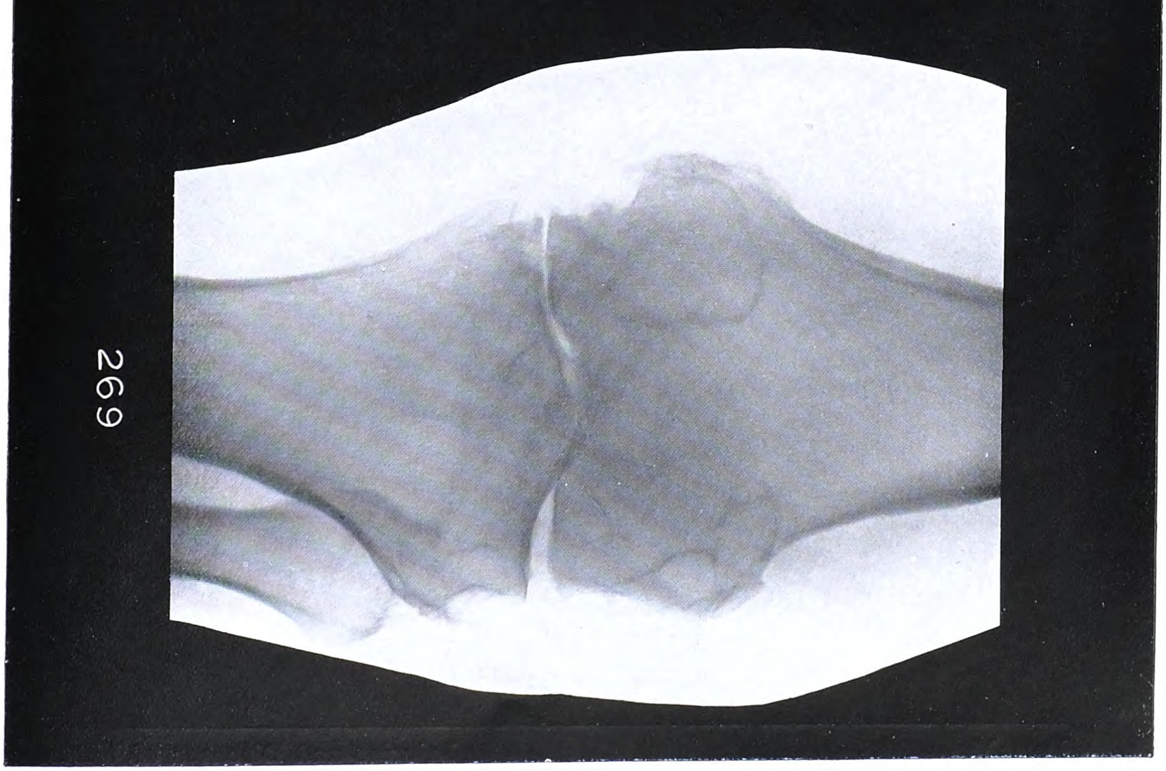

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INJURIES AND DISEASES OF JOINTS, continued.

Figs. 270, 271.—Osteo-Arthritis.

Fig. 270.—Osteo-arthritis of Hip. (*See Fig.* 21.)

The patient, a woman of 59, had difficulty in walking. Movements were limited and painful.

The joint surfaces are irregular below. The head of the femur is mush-roomed. Osteophytes project from the the acetabulum, and were no doubt the cause of the limitation of movement.

[*Mr. Braithwaite.*]

Fig. 271.—Osteo-arthritis of Knee. (*See Fig.* 22.)

Large osteophytic growths project into the synovial cavity. The patellar ligament would seem to be normal, but there is an isolated mass of bony material in the quadriceps tendon. There is no evidence in the skiagram of osteophytes lying free in the joint.

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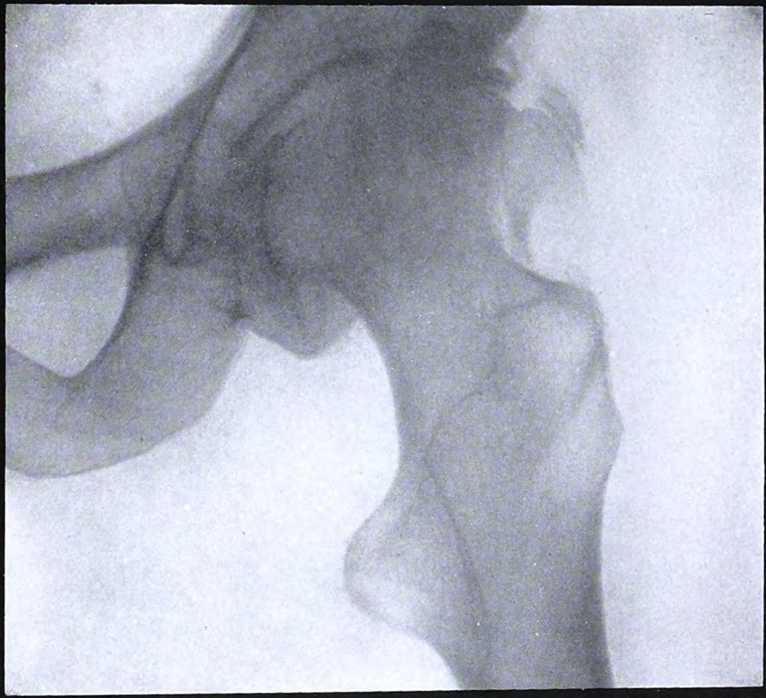

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PART VI.

MISCELLANEOUS

MISCELLANEOUS.

Figs. 276–291.—Congenital Deformities.

Fig. 276.—Foot. (*See Fig.* 48.)

The great toe is adducted, and a wide space separates it from the second toe. This condition holds in most monkeys, but tends to disappear in the higher apes.

[*Mr. Coupland.*]

Fig. 277.—Köhler's Disease. (*See Fig.* 47.)

The scaphoid shows flattening, and fragmentation of its ossific centre.

The disease must never be diagnosed in children under five years of age, as the scaphoid only ossifies during the fourth year.

Fig. 278.—Hand. (*See Fig.* 32.)

There are only three metacarpals; the outer one is very massive, and articulates with two phalanges. The first phalanx of the little finger is diminutive, and articulates with the innermost metacarpal bone. The little finger is abducted at right angles to the hand.

Fig. 279.—Accessory Thumb. (*See Fig.* 32.)

The baby, age 6 weeks, was brought up for removal of the additional digit. The end of the first metacarpal is broadened, and was found at operation to articulate with both thumbs.

Note the extra thumb at right angles to the main one, and its dwarfed ungual phalanx.

[*Mr. Braithwaite.*]

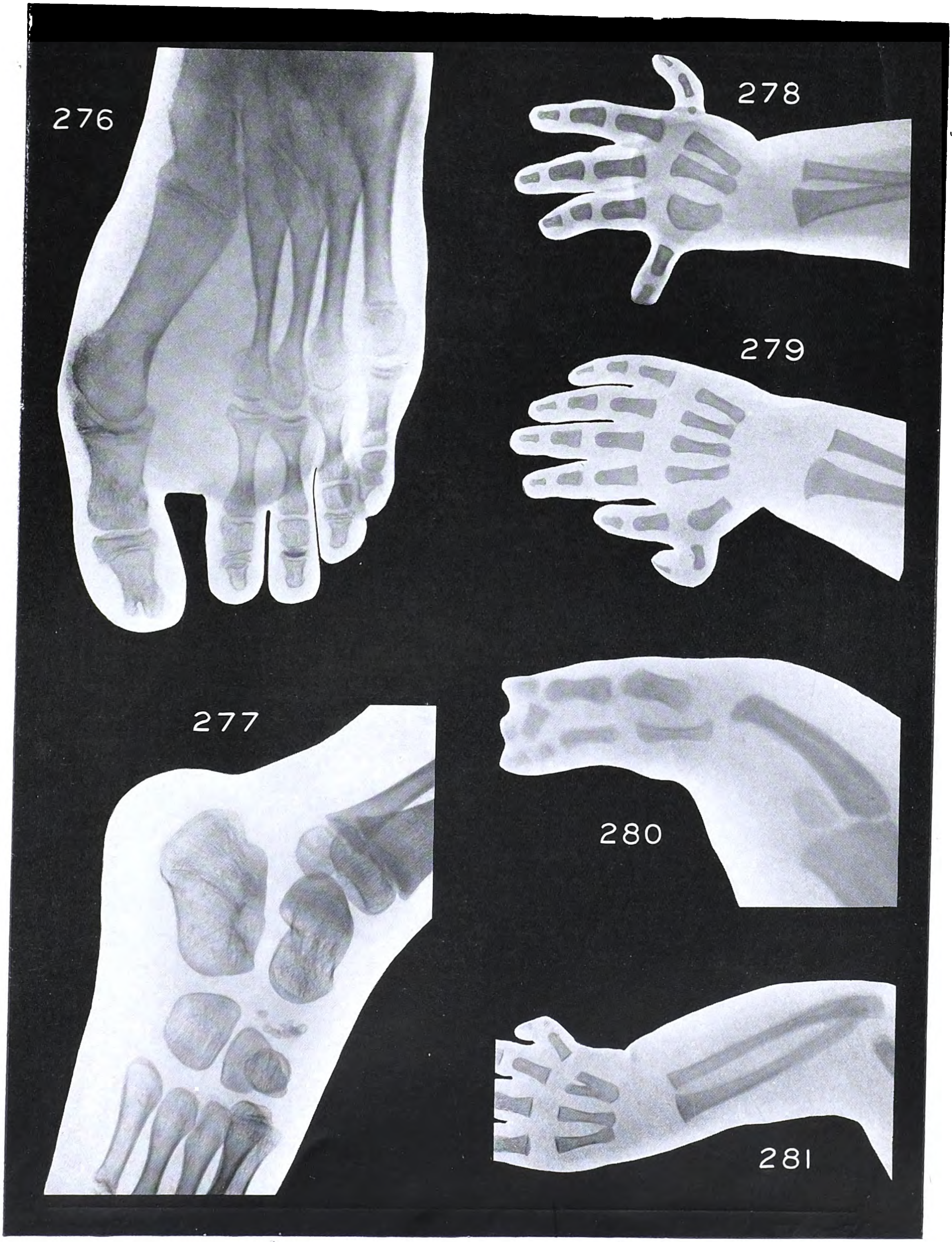
Fig. 280.—Hand. (*See Fig.* 32.)

The hand is represented by a notched blunt appendage. The radius exists only as an oval semi-transparent mass of bone near the elbow. There appear to be only two metacarpals, and two rudimentary fingers bridged across near their tips by two phalanges, and elsewhere by soft tissues.

Fig. 281.—Hand. (*See Fig.* 32.)

The thumb is entirely absent. There are two normal metacarpals, and a bifid one which articulates at its bifid end with the last two fingers.

The os magnum has begun to ossify.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MISCELLANEOUS, continued.

Figs. 282, 283.—CONGENITAL DEFORMITIES (*continued*).

Fig. 282.—CONGENITAL ELEVATION OF THE SHOULDER (SPRENGEL'S). (*See Fig.* 27.)

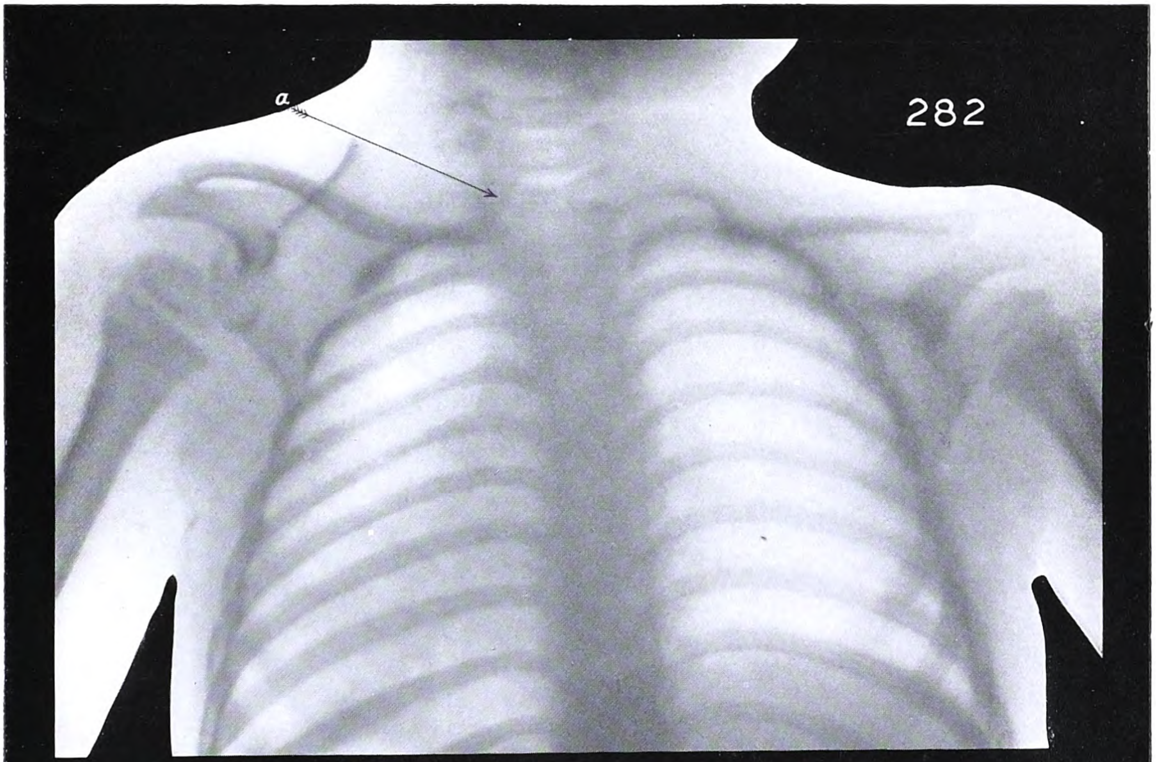
Note the raising of the right shoulder. The skiagraph shows the clavicle raised at its outer end, and the scapula coming well into view instead of lying behind the chest. An adventitious plaque of bone (*a*) is seen. This was removed at operation and was found to lie in the rhomboid. The trapezius and rhomboid muscles were freely incised where taut. The result was excellent.

[*Mr. Daw.*]

Fig. 283.—CONGENITAL ABSENCE OF THE RADIUS. (*See Figs.* 17, 20.)

"This condition was found on the left side in a male, age 18, otherwise normal. His family history was good. The humerus is about 1 in. shorter than the normal one; there is a great deficiency in muscular development. The elbow-joint is very limited in its movement. The carpus articulates with the outer border of the ulna, which is curved and shortened. The hand is usually pronated; almost full supination is possible with assistance. The scaphoid, trapezium, and thumb are absent. Syndactylism occurs in the second and third fingers, which cannot be fully extended. His first and fourth fingers are abducted. He grips firmly by flexing his wrist and fingers, especially the first, on his elbow. Movement up and down in the axis of the false joint is very free. In supination the wrist moves dorsally over the ulna."

[*Brit. Med. Jour.* 1923, Feb. 24.]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MISCELLANEOUS, continued.

Figs. 284–287.—Congenital Deformities (*continued*).

Figs. 284, 285.—Lumbar Spina Bifida.* (*See Frontispiece.*)

Note the large clear sac in *Fig.* 284, and its shadow in *Fig.* 285, which is a postero-anterior view.

Fig. 286.—Cervical Spina Bifida. (*See Frontispiece.*)

A baby, age 3 months.

A small sac is apparent in the nape of the neck: it was successfully removed. No communication with the dura mater was found.

[*Mr. Richardson.*)

Fig. 287.—Encephalocele. (*See Frontispiece.*)

The baby, age 6 weeks, was admitted for swelling of the head. The tumour communicated with the brain at the lambdoid suture. Its opacity suggests the presence of brain within.

[*Mr. Thompson.*]

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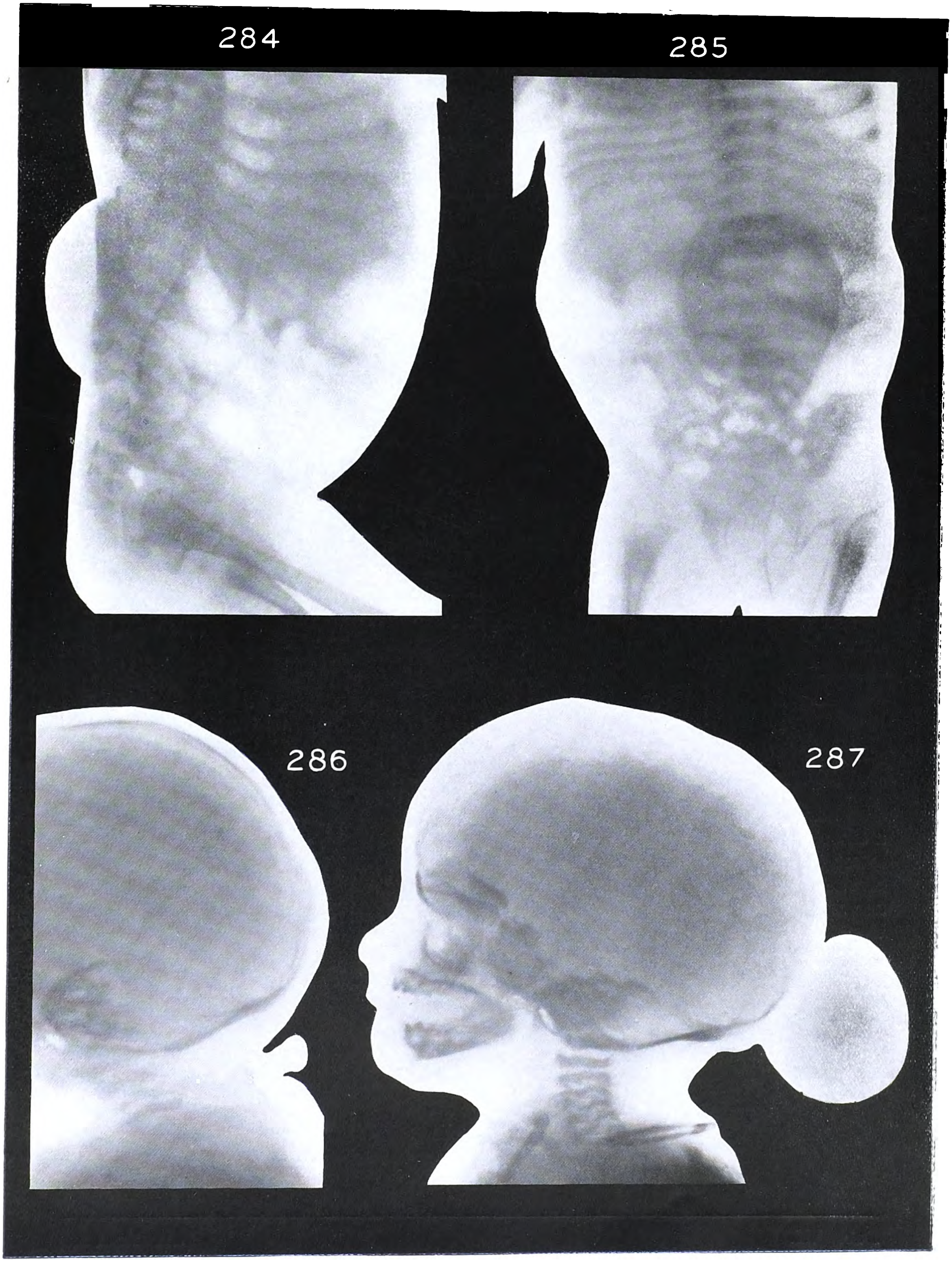
* A twin, age 5 weeks, was admitted to the General Infirmary at Leeds with a large thin-walled meningocele in the lumbar region. Both legs were paralysed, the one quite flaccid, the other showing some resistance to movement. There was a suspicion of condylomata in the anal region, and the facies further suggested a syphilitic taint, but the family history was good, and the other twin to all appearance healthy.

At operation, all the lumbar laminæ were wanting and the cord was lying on the posterior surfaces of the vertebral bodies. The sac was excised. In the belief that spina bifida is a symptom, and not simply a congenital defect, I threaded silkworm sutures from the subdural space into the erector spinæ muscles, hoping that thereby the cerebrospinal fluid would drain off into the muscular spaces. The wound was then closed, but remained unhealed for about two weeks, during which time it discharged cerebrospinal fluid copiously. Rapid healing now began, and after three days hydrocephalus developed. As the condition was causing great pain, it was decided to drain the lateral ventricle. A curved incision was made over the parietal bone about one inch above the external auditory meatus. A portion of the bone was removed with scissors, and a crucial incision into the dura was made. The brain, thus exposed, was unduly moist. A bundle of short silkworm sutures were thrust into the ventricle, and a large amount of cerebrospinal fluid welled up. The bundle was secured to the cerebral surface of the dura mater, and the skin drawn together with silkworm sutures. The cranial bones at first moved curiously on each other, but twelve hours later the skull had consolidated.

This apparently gave relief from the pain, and there was no return of the hydrocephalus during the three weeks following. The spina bifida wound remained closed. One week after discharge the child died. No particulars were obtainable.

The rapid development of hydrocephalus following the healing of the spina bifida wound is a strong argument in favour of the theory, advanced by John Frazer and others, that spina bifida should not be regarded as a purely local defect, but as the sign, in the cord, of increased pressure of the cerebrospinal fluid. The cause of this increased pressure is probably some interference with its outflow, possibly by adhesions. (*Brit. Med. Jour.*, 1923, Nov. 10.)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MISCELLANEOUS, continued.

Figs. 288-289.—Congenital Deformities (*continued*).

Fig. 288.—Cervical Rib. (*See Fig.* 27.)

This shows a girl, age 19. Tenderness led to the discovery of a hard mass in the neck, and inspection in certain positions demonstrated a prominence. Examination revealed a well-defined bone extending forwards from the transverse process of the vertebra to the first rib. On it was the lowest cord of the brachial plexus, which could be rolled under the finger, and was tender.

A cervical rib is present on both sides. The one on the left side, causing symptoms, is about two inches long. Proximally it articulates with the body and the massive transverse process of the sixth vertebra; distally it has an articulation with a process of the first rib. On the right side the shape of the rib is indefinite, so that its connections are not readily ascertained.

At operation a large portion of the accessory rib was removed. The patient complained of some numbness along the outer border of the hand and thumb, but this soon disappeared.

[*Mr. Dobson.*]

Fig. 289.—Cervical Process. (*See Fig.* 27.)

Large transverse processes project from the sixth vertebra, and from these a fibrous band passes to the first rib. It is the pressure of this band on the lower cord of the brachial plexus which gives rise to pain along the inner border of the forearm, and wasting of the small muscles of the hand. The symptoms are apt to occur in people who have to carry weights and have laborious occupations. Loss of muscle tone is given as the reason for its occurrence in the middle-aged. This cord interferes with the subclavian artery in some cases. Division of the band is the main objective in operation.

[*Mr. Dobson.*]

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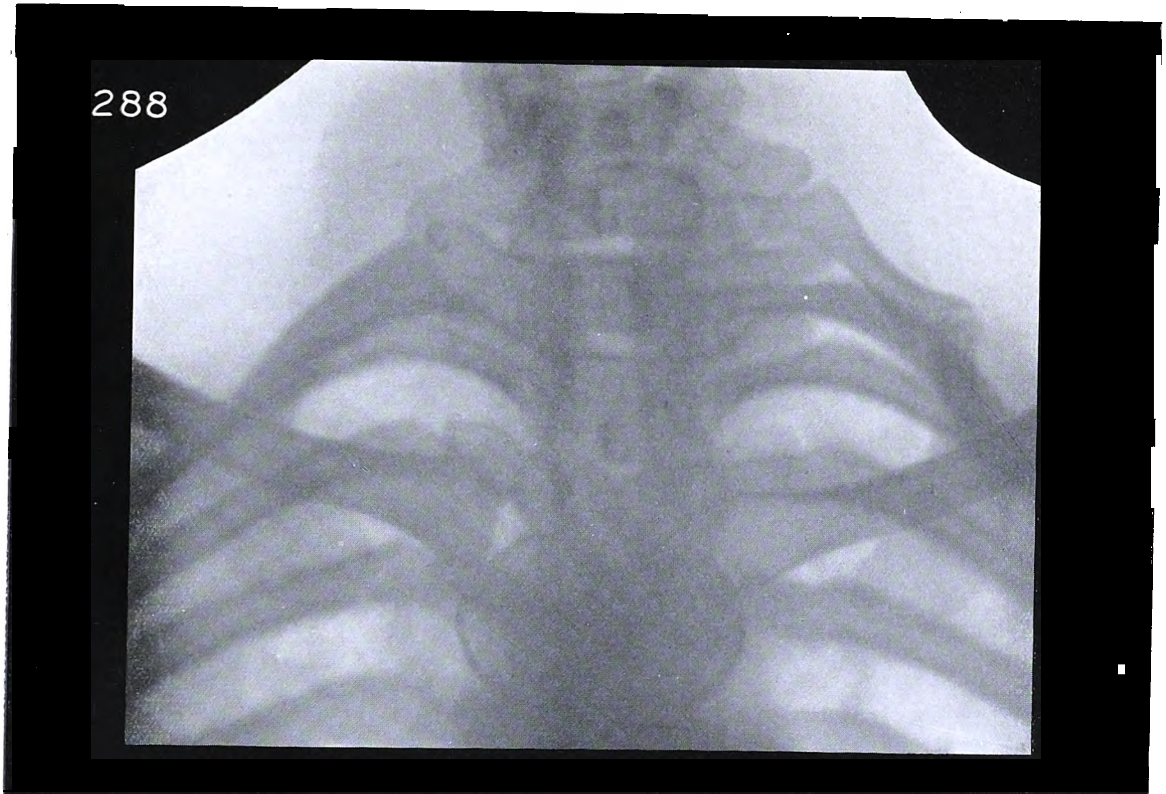

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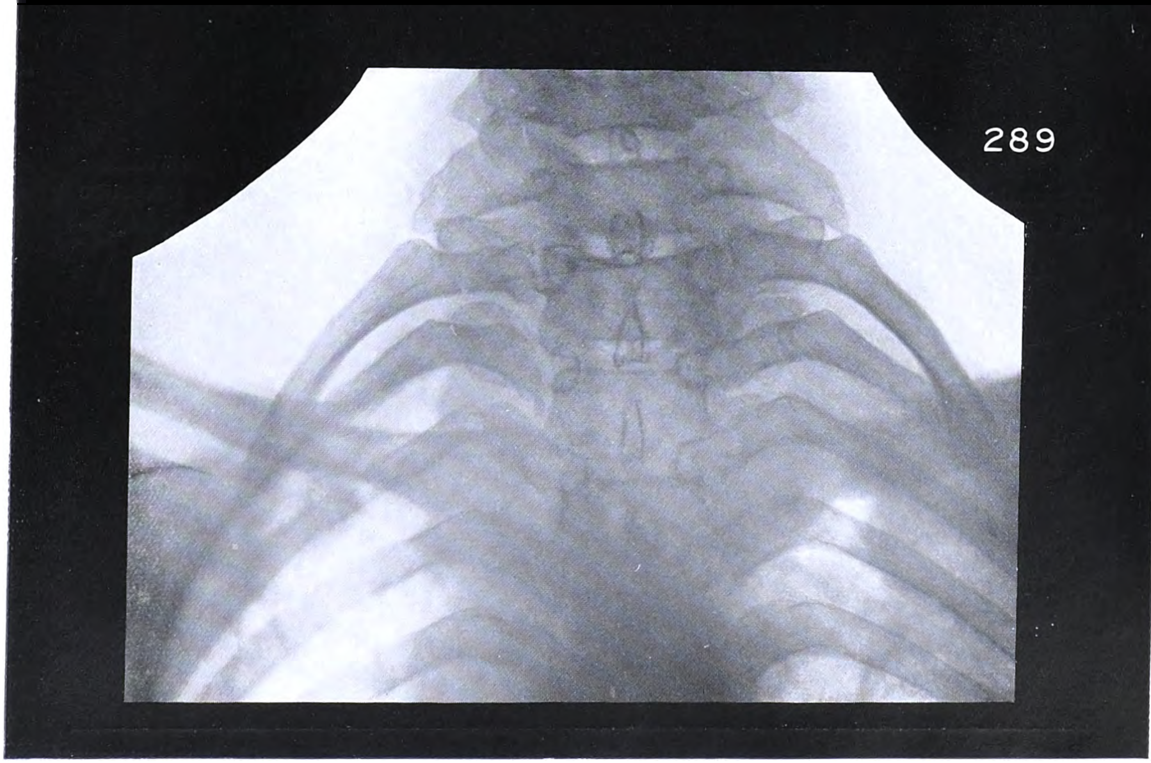


MISCELLANEOUS, continued.

Figs. 290–291.—Congenital Deformities (*continued*).

Fig. 290.—Nævus of Chest. (*See Frontispiece.*)

A large mass is apparent, filling up the right axilla and extending as far as the ninth rib. The mass showed dilated veins; it was markedly expansile with respiration, coughing, and struggling. Areas of resonance were present. The signs somewhat resembled those of a hernia of the lung, but the presence of normal ribs excluded that diagnosis.

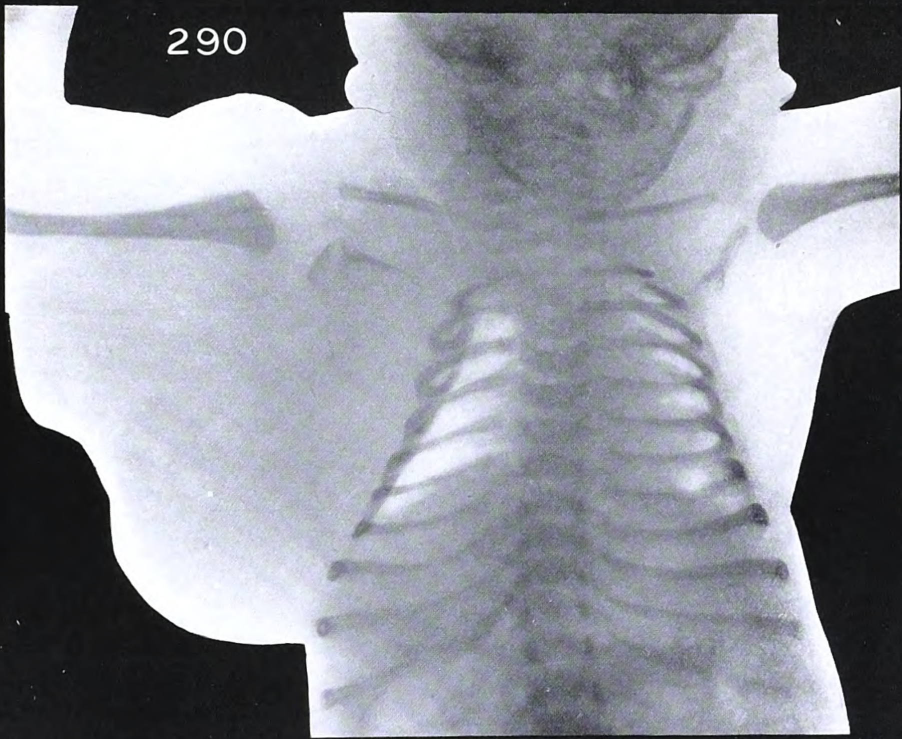
The tumour has somewhat separated the humerus from the glenoid cavity.

[*Mr. Collinson.*]

Fig. 291.—Pharyngeal Diverticulum. (*See Fig.* 27.)

The pouch, which is to the left of the middle line, has been filled by swallowing barium sulphate. It is seen to extend behind the sternum. The pressure of the filled sac between the sternum and the vertebral column causes dysphagia.

[*Sir Berkeley Moynihan, Bart.*]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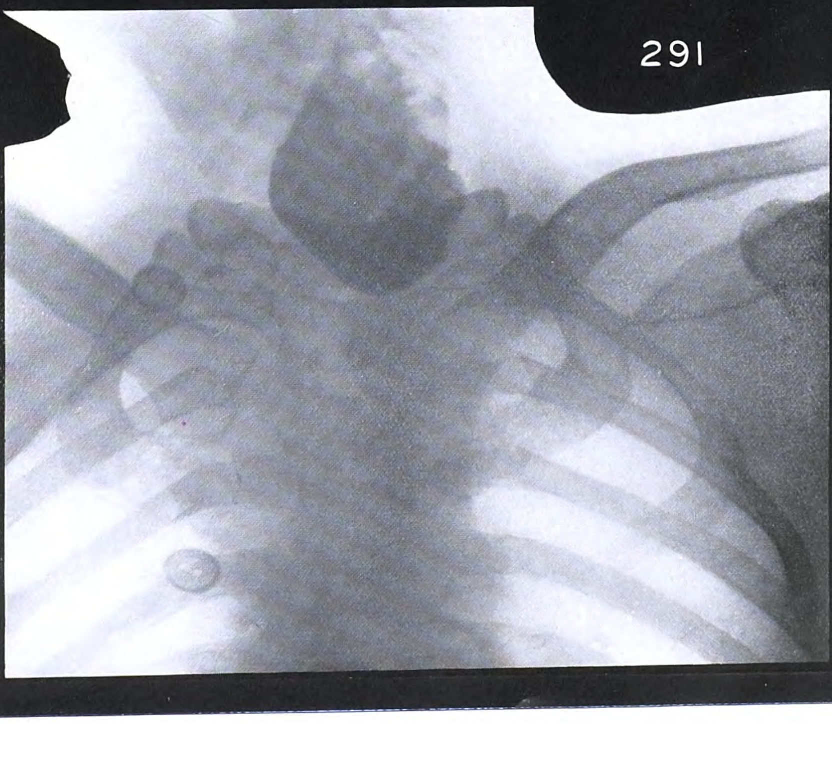
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MISCELLANEOUS, continued.

Fig. 292.—Halfpenny in Œsophagus.

A coin is clearly manifest at the commencement of the œsophagus. It caused dysphagia and some dyspnœa. It was successfully removed.

[*Mr. Bain.*]

Fig. 293.—Shot in Forearm.

A gamekeeper, age 47, was hit in the forearm. The arm was extensively lacerated, and much skin lost. Healing took place by granulation, but only after numerous sequestra had been shed.

Note the general 'peppering' of the forearm. The radius was shattered about the middle.

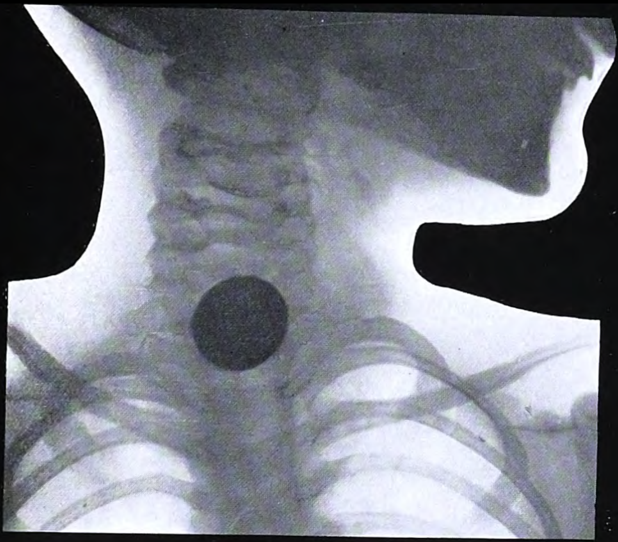
[*Mr. Flint.*]

Figs. 294, 295.—Needle in Thumb.

In all cases two positions must be screened, or, better still, a stereoscope used.

Figs. 296, 297.—Needle in Finger.

Two positions are shown, as in *Figs.* 294, 295. Note how the addition of the silhouette indicates the depth of the foreign body from the surface.



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MISCELLANEOUS, continued.

Fig. 298.—Branchial Sinus.

Boy, age 17. There was a depressed sinus between the two heads of the sternomastoid, about one inch above the clavicle, which had discharged from birth, and more so when he had coryza. A probe showed the sinus to be quite superficial to the sternomastoid as far as the angle of the jaw, where it passed deeply inwards. Large supratonsillar fossæ were present on each side, but no communication was made out with the sinus.

At operation, a probe was passed into the sinus and an incision made on to it. The sinus, thus revealed, was like a stout vein. It passed obliquely round the anterior border of the sternomastoid, and was dissected upwards to a point $\frac{3}{4}$ in. above the angle of the jaw, where it apparently ended. It had no relation with the carotid arteries.

The sinus measured $3\frac{7}{8}$ in. long and $\frac{1}{4}$ in. in diameter. Above, the wall of the sinus was thick and studded with lymphoid nodules. There was suggestion of a diverticulum.

Microscopically, the lining consisted in its upper part of columnar epithelium with much lymphoid material; below, squamous epithelium formed the lining.

A probe has been passed into the sinus, and the patient radiographed. Note the external opening, and the termination.

[*Mr. Richardson.*]

Fig. 299.—Thyroglossal Sinus.

Occurred in a boy, age 7. The sinus was first noticed when he was 18 months old, and has since remained stationary. At times a swelling appeared, and then he had pain during mastication; otherwise there was no inconvenience except a thin discharge, occasionally replaced by a sticky yellow fluid. A sinus was present in the mid-line of the neck, surrounded by cicatrices. It moved on deglutition, and was palpable as a firm cord attached to the hyoid bone.

'Bipp' has been introduced into the sinus by means of a large-bore syringe. The opaque material is seen passing up towards the hyoid bone. Another attempt at filling the sinus succeeded in locating it just below and in front of the hyoid bone, which was just visible.

At operation the sinus was found to end in a fibrous cord, which passed into the median raphé above and in front of the hyoid bone.

[*Dr. Seaton.*]

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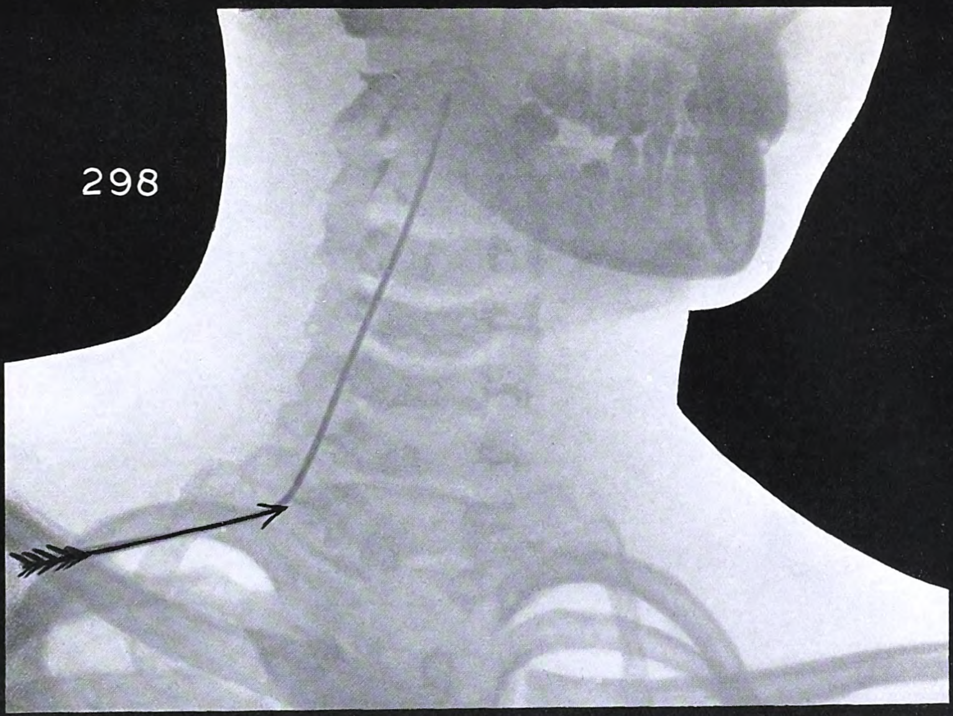

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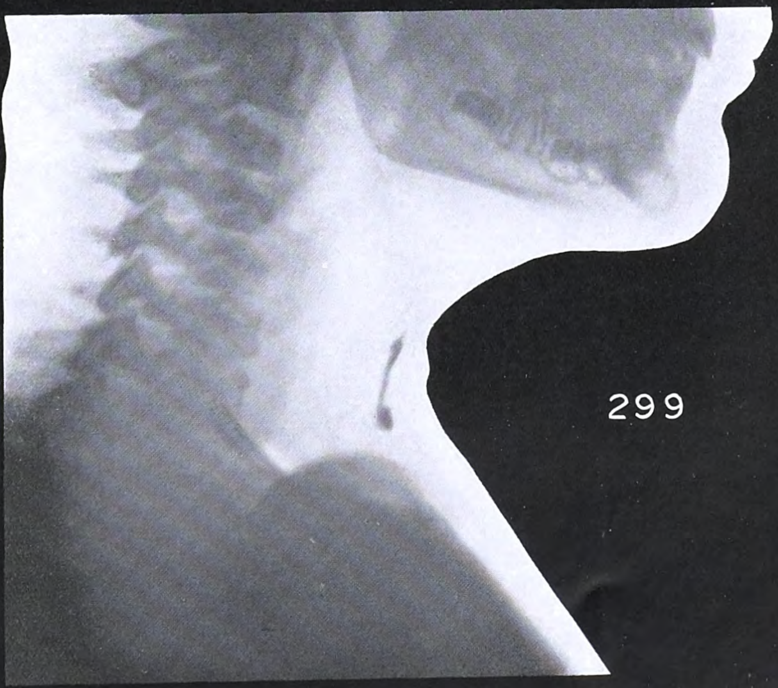

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Fr.—Frontispiece

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